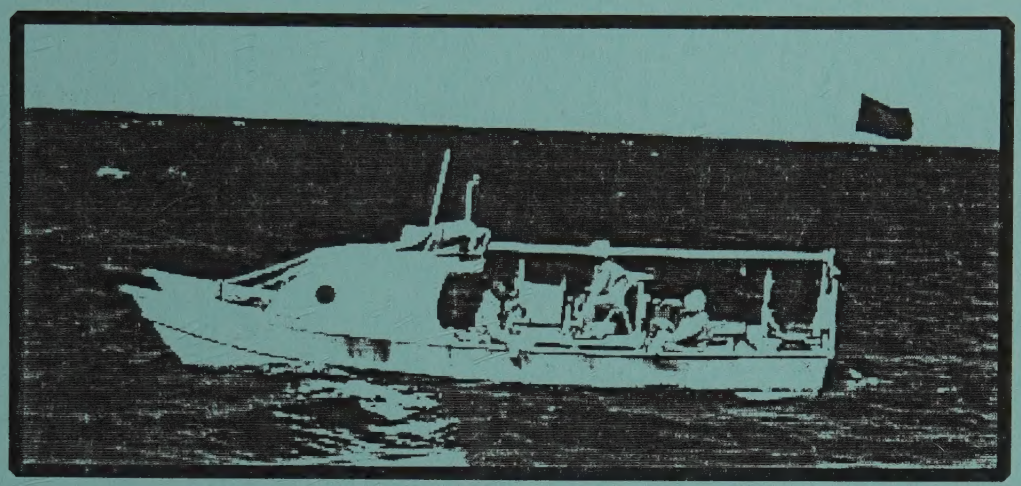
Pelagic Fisheries of the Western Pacific Region



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National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

Draft 10/15/97

October 1997

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for the

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Pelagic fisheries of the Western Pacific Region — 1996 Annual Report

Introduction

Background

The Fishery Management Plan (FMP) for Pelagic Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) on 23 March 1987. The Western Pacific Regional Fishery Management Council (WPRFMC or Council) developed the FMP to manage the pelagic resources covered by the Magnuson Fishery Conservation and Management Act of 1976 and occurring in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands, and other US possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef & Palmyra island, Jarvis Island, Howland and Baker Islands, and wake Island).

The objectives of the Pelagics FMP were revised in 1991. The abridged objectives are to:

- Manage fisheries for management unit species to achieve optimum yield.
- Promote domestic harvest of, and domestic fishery values associated with, Pacific pelagic management unit species, or PPMUS[1] (e.g., by enhancing the opportunities for satisfying recreational fishing experience, continuation of traditional fishing practices, and domestic commercial fishermen to engage in profitable operations).
- Diminish gear conflicts in the EEZ, particularly in areas of concentrated domestic fishing.
- Improve the statistical base for conducting better stock assessments and fishery evaluations.
- Promote the formation of regional/international arrangements for assessing and conserving PPMUS throughout their range.
- Preclude waste of PPMUS associated with longline, purse seine, pole-and-line or other fishing operations.
- To promote domestic marketing of PPMUS in American Samoa, Guam, Hawaii and Northern Mariana Islands.

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[1] The Magnuson Act was amended to allow the inclusion of tunas in US fishery management authority as of January 1992. In the Pacific, tuna management is the responsibility of the regional fishery management councils. Pacific pelagic management unit species (PPMUS) includes former pelagic management unit species (PMUS) and tunas.

The Pacific pelagic management unit species (PPMUS) are[2]:

English Common Name	Scientific Name
Mahimahi (dolphinfishes)	*Coryphaena* spp.
Wahoo	*Acanthocybium solandri*
Blue and black marlins	*Makaira* spp.
Striped marlin and shortbill spearfish	*Tetrapturus* spp
Swordfish	*Xiphias gladius*
Sailfish	*Istiophorus platypterus*
Requiem sharks (oceanic species)	family Carcharinidae
Thresher sharks	family Alopiidae
Mackerel sharks	family Lamnidae
Hammerhead sharks	family Sphyrnidae
Yellowfin, bigeye, albacore, and bluefin tunas	*Thunnus* spp
Skipjack tuna	*Katsuwonus pelamis*
Kawakawa	*Euthynnus affinis*
Frigate and bullet tunas	*Auxis* spp
Slender tuna	*Allothunus fallai*
Dogtooth tuna	*Gymnosarda unicolor*
Mackerel	*Scomber* spp
Moonfish[3]	*Lampris* spp
Oilfish family	Gempylidae
Pomfret (oceanic species)	family Bramidae

Non-tuna PPMUS are sometimes referred to as "other PPMUS" in this report. This term is equivalent to PMUS (Pelagic Management Unit Species) used in annual reports previous to 1992, before tunas were included in the management unit.

The PPMUS are caught in the troll, longline, handline and pole-and-line (baitboat) fisheries. they are caught in oceanic as well as insular pelagic waters. Most of these species are considered to be epipelagic because they occupy the uppermost layers of the pelagic zone. All are high-level predators in the trophic sense. pelagic fisheries for PPMUS are among the most important, if not the dominant Pacific Island fisheries.

The FMP requires the Council's Pelagic Plan Team (Team) to prepare an annual report on the status of the pelagic fisheries taking place in each of the island areas served by the Council (American Samoa, Guam, Hawaii and Northern Mariana Islands), to evaluate the effectiveness of the FMP in meeting its goals and objectives, and make recommendations for future management and administrative action.

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[2] Classifications in this table follow Amendment 6 to the FMP, effective 27 November 1992.

[3] Moonfish, oilfish and pomfret were added to the FMP by Amendment 7, effective 24 June 1994

Report Content

This report contains fishery performance data from each of the four island groups through 1996, interpretations of trends or important events occurring in the fisheries, and recommendations. This report was prepared using reports submitted by the following agencies . The Hawaii report is an integration of State of Hawaii Division of Aquatic Resources and NMFS summaries.

- Territory of American Samoa, Department of Marine and Wildlife Resources
- Territory of Guam, Division of Aquatic and Wildlife Resources
- Territory of Guam, Department of Commerce
- State of Hawaii, Division of Aquatic Resources
- Commonwealth of the Northern Marianas, Division of Fish and Wildlife
- National Marine Fisheries Service, Southwest Region (including Southwest Fisheries Science Center Honolulu Laboratory, Pacific Area Office and Office of Enforcement)
- US Coast Guard, District 14
- Pacific Fisheries Research Program, University of Hawaii

Report Appraisal

Report Content has not changed significantly from previous years.

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Table 1. Names of Pacific pelagic management unit species

English Common Name	Scientific Name	Samoan or AS local	Hawaiian or HI local	Chamorro or Guam local	S. Carolinian or NMI local	N. Carolinian or NMI local
Mahimahi (dolphinfishes)	*Coryphaena* spp.	Masimasi	Mahimahi	Botague	Sopor	Habwur
Wahoo	*Acanthocybium solandri*	Paala	Ono	Toson	Ngaal	Ngaal
Indo-Pacific blue marlin Black marlin	*Makaira mazara:* *M. indica*	Sa'ula	A'u, Kajiki	Batto'	Taghalaar	Taghalaar
Striped marlin	*Tetrapturus audax*		Nairagi			
Shortbill spearfish	*T. angustirostris*	Sa'ula	Hebi	Spearfish		
Swordfish	*Xiphias gladius*	Sa'ula malie	A'u kū, Broadbill, Shutome	Swordfish	Taghalaar	Taghalaar
Sailfish	*Istiophorus platypterus*	Sa'ula	A'u lepe	Guihan layak	Taghalaar	Taghalaar
Oceanic sharks	Alopiidae, Carcharinidae, Lamnidae, Sphynidae	Malie	Mano	Halu'u	Paaw	Paaw
Albacore	*Thunnus alalunga*	Apakoa	'Ahi palaha, Tombo	Albacore	Angaraap	Hangaraap
Bigeye tuna	*T. obesus*	Asiasi, To'uo	'Ahi po'onui, Mabachi	Bigeye tuna	Toghu, Sangir	Toghu, Sangir
Yellowfin tuna	*T. albacares*	Asiasi, To'uo	'Ahi shibi	'Ahi, Shibi	Yellowfin tuna	Toghu
Northern bluefin tuna	*T. thynnus*		Maguro			
Skipjack tuna	*Katsuwonus pelamis*	Atu, Faolua, Ga'oga	Aku	Bunita	Angaraap	Hangaraap
Kawakawa	*Euthynnus affinis*	Atualo, Kavalau	Kawakawa	Kawakawa	Asilay	Hailuway
Dogtooth tuna	*Gymnosarda unicolor*	Tagi	Hagatsuo	Dogtooth or white tuna	Ayul	Owel
Moonfish	*Lampris* spp	Koko	Opah		Ligehrigher	Ligehrigher
Oilfish family	Gempylidae	Palu talatala	Walu, Escolar		Tekiniipek	Tekiniipek
Pomfret	family Bramidae	Manifi moana	Monchong			
Other tuna relatives	*Auxis* spp, *Scomber* spp; *Allothunus* spp	(various)	Ke'o ke'o, saba (various)	(various)	(various)	(various)

Table 2. Total 1996 pelagic landings[4] (in lbs) in the Western Pacific Region

Species	American Samoa	% change	Guam	% change	Hawaii	% change	Northern Marianas	% change	Total	% change
Mahimahi	12,955	6.9	303,957	-5.3	700,000	-30.0	28,524	53.55	1,045,436	-22.7
Wahoo	11,986	-6.3	142,062	80.9	500,000	-16.7	8,626	89.37	662,674	-4.8
Blue marlin	37,682	50.0	60,500	-40.3	1,900,000	0.0	6,874	29.82	2,005,056	-1.3
Black marlin*										
Striped marlin					1,000,000	-23.1			1,000,000	-23.1
Spearfish*			967	31.0					967	31.0
Sailfish*	5,535	-10.5		-100.0			545	598.72	6,080	-19.0
Swordfish	1,332	100.0			5,900,000	0.0			5,901,332	0.0
Misc billfish					400,000	-20.0			400,000	-20.0
Yellowfin	93,292	53.1	102,670	31.6	3,800,000	-17.4	30,410	88.55	4,026,372	-15.3
Bigeye	10,005	93.5			5,200,000	13.0			5,210,005	13.1
Albacore	232,721	323.9			3,000,000	-3.2			3,232,721	2.5
Bluefin					100,000	0.0			100,000	0.0
Skipjack	75,967	-57.7	215,944	12.3	2,300,000	21.1	132,155	25.40	2,724,066	14.6
Kawakawa*	225	-40.6	4,043	219.4					4,268	159.5
Dogtooth	5,932	360.2	2,063	552.8			10,519		18,514	1053.5
Misc tunas		-100.0			10,000	0.0	2558	593.20	12,558	17.3
Sharks	12,747	96.9	3,348	-70.1	4,500,000	28.6			4,516,095	28.4
Barracuda	4,531	28.9	5,500	177.6			234	52.94	10,265	81.7
Rainbow runner*	1,218	-55.9	23,902	770.1			885	62.68	26,005	329.6
Moonfish					700,000	16.7			700,000	16.7
Pomfret*										
Misc pelagics	1,034	4823.8	1,011	83.2	100,000	0.0	3633	53.60	105,678	5.2
Total	507,162	36.5	865,967	9.5	30,110,000	1.3	224,963	46.60	31,708,092	2.2

* NMFS Hawaii longline logbook summaries aggregate several billfish and tuna species (noted with *) into miscellaneous billfish, tuna, and pelagics categories. All Hawaii totals shown here are NMFS estimates and rounded to the nearest 100,000 lb, except for bluefin tuna and misc. tunas.

[4] Landings are reported in island reports (Appendices 1-4), which include recreational and commercial domestic landings data, where available (e.g., for Hawaii, only commercial landings). In some cases, totals may not add precisely due to rounding. These do not include foreign transshipment or domestic cannery landings, which may be reported separately in island modules.

Summary

1) No FMP or regulatory amendments governing Western Pacific pelagic fisheries were proposed by the Council in 1996. See Administrative Activities for details. No permits were requested by any foreign nations to fish in the US EEZ of the Western Pacific Region.

Island summaries

2) In **American Samoa** pelagic fishing effort and landings of PPMUS of in American Samoa continued the upward trend which commenced in 1994. This reflects the continued interest in small scale longline fishing in the territory, targeting mainly albacore. An estimated 507,162 lb (+36 %)[5] of pelagic fish were landed in 1996, of which 472,672 (+33%) were commercial landing valued at $ 620, 473 (+55%). The average price for all pelagics was $1.31/lb (+16%), which reverses a decline which began in 1993.

The number of boats in the pelagic fishery during 1996 increased 5% from 1995. A total of 45 vessels made an estimated 2130 trips (+5%) and the average trip duration of 6.6 hr/trip, similar to the 6.7 hr/trip in 1995. While twice as many fishing trips used trolling gear (1372 trolling trips vs 758 longline trips), about the same amount of time was used fishing with both gear types (6914 trolling hours vs 7194 longline hours). Data on catch per unit of effort (CPUE) from the troll fishery suggested that the 1996 CPUE was slightly higher than in 1995 , due to increased CPUE for mahimahi, blue marlin and yellowfin tuna. The overall average CPUE for longline fishing in 1996 was 40.4 fish/1000 hooks, of which 30.9 fish/1000 hooks, or 77%, were albacore.

Cannery landings at Pago Pago comprised 103,600 t of skipjack, 30,000 t of yellowfin and 44,500 t of albacore. Most of these fish are caught in distant water fisheries, predominantly in the Western Tropical Pacific. Landings have remained relatively stable during the 1990s although there is a increasing trend in the volume of landed albacore, which partially reflects the increased longline fishing activity in both American and Western Samoa.

3) In **Guam** landings of all pelagics increased to 865,967 lb (+9%), but total revenues decreased to $357,244 (-34%), and adjusted revenues decreased by the same amount. Other PPMUS landings declined only slightly to 512, 925 lb (-0.3%) but adjusted revenues fell to $234,486 (-35%). Tuna landings increased to 322,657lb (+19%), but revenues declined markedly, in common with other PPMUS, to $116,130 (-33%). The pelagic fishery in Guam continues to expand, with a shift in the fishery from tunas to other PPMUS, principally mahimahi. Mahimahi comprised 35% of the total pelagic landings, followed by skipjack (25%), wahoo (16%), yellowfin tuna (11.9%) and blue marlin (7%).

Guam's adjusted prices for pelagic fish have shown a general decline since 1980, although the price ($/lb) of non-tuna PPMUS increased by 16% from 1995.

---

[5] Percentages in parentheses indicate percent change from previous year

Virtually all the landings of pelagic fish are made by trolling vessels and the number of vessel in the fishery reached a new record high of 482 (+11%) in 1996. This continues an overall increasing trend in fleet size since 1980. The number of trips (15,936, -14%) declined significantly in 1996, but hours fished (65,952, -3.5%) and hours per trip (3.6, 5%) on declined only slightly.

A total of 421 foreign longliners made 1,253 port calls and transshipped 9,460 tons of fish through Guam. This included 6,653 tons of yellowfin tuna (70% of the total catch), 2,014 tons of bigeye tuna (21%), 417 tons of blue marlin, and 375 tons of albacore tuna, black marlin, striped marlin, swordfish, and others combined.

4) The **Hawaii** fisheries for PPMUS produced total pelagic landings of 30.1 million lb in 1996, only slightly less (-1.2%) than the volume produced in 1995 (30.5 million lb). Swordfish landings (5.9 million lb) in 1996 were similar to 1995 (6 million lb), a decrease of only 1.7%. Swordfish continued to be the dominant species (20%) in the pelagic fishery. Other major components of the pelagic fishery include bigeye (17%), yellowfin (13%) and albacore (10%) tunas, and sharks (15%). Blue marlin catches declined only slightly (-5%) from 1995 while striped marlin catches were significantly reduced in 1996 (-23%). Mahimahi landings were also markedly reduced (-36%) in 1996, while tuna landings remained more or less unchanged (-1.7%) from 1995. The numbers of sharks retained for finning increased in 1996 and this is reflected in the estimated landed whole weight of sharks which rose by 29%.

Total pelagics revenue increased slightly (+5%) to $ 57 million, due to slightly increased price per pound (+6%) for pelagic fish in 1996. The inflation adjusted ex-vessel revenue for the longline fishery increased slightly in 1996 (+5.5%), while the adjusted ex-vessel revenue for the troll and handline fishery decreased by a similar amount (-4.3%). There was, however, a marked increase (+44%) in the adjusted ex-revenue for aku baitboats in 1996.

Changes in catch rate by trollers varied by species in 1996. Ono (-21%) and yellowfin (34%) showed marked declines in catch per trip, while mahimahi catch rates changed very little between years (+3%) and blue marlin (+28%) and skipjack (+35%) showed significant increases in catch per trip. For handline fishing, swordfish (-30%), mahimahi (-4%), wahoo (-14%), blue marlin (-4%), yellowfin (-31%),and albacore (-17%) all showed declines in catch per trip. By contrast there was a 60% increase in the handline catch per trip for bigeye tuna in 1996.

The Hawaii longline fleet landed 23.0 million pounds of fish, a small (1.5%) increase on the 1995 landings. Of the billfish landed in Hawaii, longlining accounted for almost all the swordfish (99.9%) and striped marlin (100%), and 58% of the blue marlin. About 36% of the longline landings (8.2 million lb) were billfish and 72%b of billfish landings were swordfish. The longline fleet also accounted for most of the bluefin tuna (100%), bigeye tuna (94%), albacore (84%), moonfish (≈100%), sharks (≈100%) landed in Hawaii. Estimated shark catches continued to increase due to a greater finning activity onboard longline vessels. The bluefin landings nearly doubled between 1995 and 1996.

Hawaii's troll and handline catches of pelagics decreased to 5.4 million lb (-16%). Yellowfin tuna and wahoo were the only species caught predominantly by troll and handline fishermen. Baitboat and troll fishermen caught almost all of the skipjack tuna.

Fishing effort for the combined pelagic fisheries in Hawaii remained at a high level in 1995. The number of longline vessels participating in this fishery reached a maximum of 141 in 1991 and has declined steadily to 103 operating in 1996 making a total of 1100 trips. This is the lowest fleet size since the expansion phase of the fishery in the late 1980s, although less trips were made in 1994 when the fleet size numbered 125 vessels. The number of trips by the troll fishery decreased by 8% to 21,611, higher than the 1979-1996 average of 17,816, but relatively static over the past ten years. The number of trips taken by aku baitboats (438) rose 16%, the second increase in two years, but was way below the long-term average between 1979-1996 (800). The number of handline trips (6,416) also rose for the second year in succession, with 17% rise from 1995.

5) Landings of all pelagics in the **Northern Mariana Islands** (NMI) increased by about 40% between 1995 and 1996 to 224,962 lb. Two thirds of this increase is due to tuna landings, although there appear to be marked in increases in the landings of most other pelagic species. The wide variation in CNMI commercial landings for the last several years were mainly due to variations in skipjack tuna landings. Skipjack landings were 20% higher (132,155) than 1995, approaching the long term average between 1983 and 1996. Yellowfin tuna landings were also high (+81%) and about twice the long term average. Landings of mahimahi were up 53% from 1995 and were almost twice the long term average. Wahoo landings rose by nearly 90% and exceeded the long term average. Blue marlin landings rose more modestly (30%), but were over twice the long term average.

The large increases in landings were also reflected in total revenues which increased by nearly 50% (431,560) and adjusted revenues by 45%. Tuna adjusted revenues rose 37%, and other PPMUS were up 71%.

The number of fishermen making commercial pelagic landings rose to 114 (28%) from 1995, the highest value yet and well above the long term average. Similarly, the number of trips landing PPMUS reached a new high (2,254), well above the long term average and a 23% increase on the previous year.

The inflation adjusted prices of other PPMUS and tunas have remained fairly stable since 1983 with the exception of a peak in other PPMUS prices in 1990 and a broad rise in tuna prices from 1990-1992. Adjusted prices have remained at long term averages in 1996.

Species summaries

6) The **swordfish** longline fishery in Hawaii began in 1989 with landings of 0.6 million lb, increasing to 3.4 million lb in 1990, and peaking at 13.1 million lb in 1993. Swordfish landings declined in 1994 and 1995 but may be leveling out and stabilizing at about 6 million lb.

Landings in 1996 amounted to 5.9 million lb, equal to the long term average for the fishery. The estimated average size of longline-caught swordfish was 157 lb in 1995, slightly above the 1987-1996 average (+3%). Swordfish comprised the largest proportion of the total non-tuna landings by all fisheries in Hawaii for the seventh consecutive year (38% in 1996, 38% in 1995, 60% in 1994, 72% in 1993, 73% in 1992, 62% in 1991, and 38% in 1990). The longline catch rate of swordfish improved in 1996 and was equal to the long term average between 1991 and 1996. There was some concern at lower than average catch rates for swordfish in 1994, but this was due partly to the longline fleet expending relatively more effort targeting tuna. Swordfish landings from non-longline gear were negligible in comparison. Other areas did not report landings of swordfish, apart from a few captures in the American Samoa longline fishery.

7) **Blue marlin** catches in American Samoa increased markedly (+43%) as a result of the expansion of the longline fishery, which took 60% of the total blue marlin catch. Guam landings of blue marlin (60,500 lb) were 40% lower than 1995, ranking fourth behind mahimahi, skipjack tuna and wahoo. Blue marlin landings (1.9 million lb) in Hawaii were slightly lower than the record high of 2 million lb in 1995. Longliners accounted for 58 % of the total Hawaii blue marlin landings. Blue marlin landings in the Northern Marianas (6874 lb) were the highest on record and more than double the long term average between 1983-1996.

The catch rate of blue marlin in the American Samoa troll fishery was higher (+22%) than in 1995, and about double the long term average. In Guam, blue marlin troll catch rates decreased markedly and were one fifth of the long term average, but this was thought to be a result of the expansion algorithm including large numbers of charter vessels. The catch rate of blue marlin in the Hawaii longline fishery decreased in 1996 (-29%) but is reasonably close to the long term average. Blue marlin tends to be caught incidentally at a higher rate on tuna trips than swordfish trips. The catch rate of blue marlin in the Hawaii troll fishery increased (+28%) and was higher than the long term average. In the Northern Marianas, the 1995 marlin catch rate was about the same as in 1995 (-0,7%) and above the long term average.

The average size of blue marlin in the Guam International Fishing Derby increased to 200.0 lb from 1995's 132.9 lb, but fewer fish were caught.

8) **Striped marlin** landings ranked third among the billfish in Hawaii (after swordfish and blue marlin), where it accounted for 6% of the commercial landings of non-tuna PPMUS. The 1996 landings of 1 million lb were (23%) lower than 1995 landings and slightly lower than the long-term average. Striped marlin is regarded as a secondary target species (after bigeye tuna) in the winter longline fishery, and it tied for second with blue marlin after swordfish in total longline landings of billfish. Landings in the Hawaii troll and handline fisheries (108,000 lb, -8%) were above the long-term average. The species rarely appears in the domestic landings from other areas.

9) **Shortbill spearfish** made up less than 1% of the PPMUS landings in Hawaii, and rarely appeared in the landings reported for other areas.

10) **Sailfish** landings were insignificant in most areas. American Samoa reported relatively landings of 5,535 lb of sailfish in 1996, a 10.5% decline on 1995 landings but four times greater than the long term average.

11) **Mahimahi** landings (12,955 lb) in American Samoa rose slightly from 1996 (+8%) and approached the peak (13.435) reported in 1986, and were over twice the long term average. Guam's 1995 mahimahi landings (303,957 lb) were down slightly (-5%) on the 1996 total but still considerably higher than the long term average. Mahimahi landings in Guam have displayed wide, unexplained annual fluctuations since 1987. The trolling catch rate declined accordingly. Mahimahi landings (700,000 lb) made up 4.5% of the 1996 non-tuna PPMUS landings in Hawaii, a decline of 1.5%. The longline fishery accounted for 33% of the 1995 landings, with the bulk of mahimahi landings coming from the combined troll and handline fisheries. The troll catch rate in Hawaii was similar to the 1995 rate and within the long-term average. Northern Marianas mahimahi landings went up to 28,524 lb (+53%) and accounted for 52% of the total non-tuna PPMUS landings. The trolling catch rate rose 17% and was slightly higher than the long-term average.

12) **Wahoo** landings in American Samoa declined slightly (-8%) to 11,986 lb, while catch rates from trolling also dropped slightly to 1.00 lb/hr, but were still substantially higher than the long term average (0.43 lb/hr). Guam's wahoo landings (142,062 lb) rose markedly by over 80 % from 1995 and catch rates doubled during 1996. Wahoo landings in Hawaii declined from 0.7 million lb to 0.5 million lb between 1995 and 1996. The trolling catch rate for wahoo in Hawaii declined by 21% than 1995, but was only slightly below the long-term average. Northern Marianas wahoo landings (8,626 lb) and catch rate in lb/trip both increased by 45%.

13) Estimated Hawaii **shark** volume increased by nearly 30% between 1995 and 1996. The landings reported here are only domestic landings. The increase is due to increased landings of shark fins, about 95% of which are from blue sharks. The price for blue shark fins has increased from $15/lb in 1992 to $26/lb in 1996 while the price for other miscellaneous shark fin has increased from $20/lb in 91 to $50/lb in 1996[6]. Shark landings from other areas were relatively minor. Virtually the entire shark landings come from longline vessels. However, the Bottomfish Plan Team has also noted that Northwestern Hawaiian Islands bottom-fishermen also land fins of coastal and reef sharks taken incidentally [7], although the quantity has not been estimated.

14) **Yellowfin tuna** landings in American Samoa (93,292) increased 53%, while catch rates were 41% higher in the troll fishery than in 1995. Guam yellowfin landings (102,670 lb) increased by over 30% but the catch rate was reduced by about 80%. This reduced catch rate is though to be an artefact resulting from the inclusion of an expanding number of tourist charter vessels in the commercial catch which have overall lower catch rates than purely commercial troll vessels. The total Hawaii landings of yellowfin (3.8 million lb) were 24% lower than 1995

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6 Dr. Samuel Pooley, NMFS Honolulu Laboratory, pers. comm.

7. WPRFMC Bottomfish Plan Team meeting, March 27-28 , 1996, Executive Centre Hotel, Honolulu, HI.

but only slightly lower than the long-term average. Landings of yellowfin by trollers and handliners in 1996 were reduced by 20%, while landings by longliners dropped by 27%. The drop in the trolling catch rate (-34%) was less than in the handline catch rate (-44%) while longline catch rates were down by 17%. Northern Marianas Islands yellowfin landings of 30,410 lb were much higher (+45%) than 1994 and was the third year in a row where catches have increased markedly. Catch rates in 1996 were about 28% higher than both those in 1995 and the long-term average.

15) **Skipjack tuna** landings in American Samoa in 1996 (75,967 lb) represented a nearly 60% drop compared with 1995 landings, while the troll catch rate has only declined by 10%. The decline in skipjack landings is due mainly to a reduction in troll fishing, while longline fishing (which does not target skipjack) has increased. Guam skipjack landings in 1996 (215,944 lb) represented an increase of 12% and catch rates were 25% higher than in 1995 Hawaii skipjack landings (2.3 million lb) rose 35 % in 1996 and were close to the long term average. The skipjack were caught mainly by baitboats, which landed 1.7 million lb of skipjack.. Both troll skipjack catch rate (+35%) and baitboat catch rate (+18%) rose markedly in 1996, and were above the long-term average. Northern Marianas Islands 1996 skipjack landings were 25% higher (132,155 lb) than 1995, continuing the reversal of the decline between 1989 and 1994. The catch rate fell slightly by 4% from 1995 and was still far below the long-term average.

16) Hawaii landings of **bigeye tuna** (5.2 million lb) were 11% higher than 1995, almost all (94%) caught by longline. No other areas reported bigeye landings apart from American Samoa, where the emergent albacore fishery caught a modest 10,000 lb of bigeye tuna.

17) American Samoa reported landing 232,721 lb of **albacore**, the highest yet recorded by the American Samoa fleet and a four fold increase on 1995 landings. Hawaii total landings of albacore (3.0 million lb) declined slightly (-6%) from 1995, although this decrease was due entirely to reduced landings by distant-water troll vessels transhipping in Hawaii. Landings of albacore by longline vessels were actually higher in 1996 than in 1995 (+23%). Other areas did not report landings of albacore.

18)**Troll fisheries** continue dominated the domestic fisheries in Guam and the Northern Marianas, in contrast to American Samoa, where the emergent longline fishery now accounts for two thirds of PMUS landings. Growing charter fishing businesses in Guam and Northern Marianas contributed heavily to troll fishing effort. In Hawaii, longline landings continue to dominate pelagic fisheries production and in 1996 accounted for over 75% of the landed volume of PMUS.

Issues

In Hawaii the issue of bycatch in the longline fishery continues to drive most of the management initiatives of the Western Pacific Fishery Council and associated agencies. The Council is concerned with longline catches of protected species such as turtles and albatross, and by the marked increase of retention and finning of blue shark by longline fishermen. The emergent longline fishery based mainly on albacore in American Samoa is also major concern for the

Council. Fishermen in American Samoa have begun to consider what management measures they wish to see implemented in this fishery.

Recommendations to the Council

1. **The Council should request the Hawaii Division of Aquatic Resources (HDAR) to develop and implement a fish dealer permitting system, and should computerize and enforce its dealer reporting system. This will further document the total volume of fish sold in the state, and will provide a cross-reference validation capability for fishermen's reports.**

   Status: A bill submitted by the Department of Land and Natural Resources (DLNR) to obtain authority to issue marine dealer permits was passed by the 1997 Hawaii Legislature. If it becomes law, the DLNR can implement a dealer permit system. Planning by NMFS and HDAR for computerizing the dealer report is underway.

2. **The Council and/or other appropriate agency should seek funding to conduct a survey of Hawaii small-scale fisheries. This survey is needed to evaluate the significance of non-commercial and part-time components of these fisheries.**

   Status: This long-standing recommendation was retained at the request of the Team because data are still not being collected on the Hawaii non-commercial pelagic fisheries. The State of Hawaii does not yet have a non-commercial fishing license and does not collect data from non-commercial fisheries on a regular basis. No funding has been available to conduct these surveys. A bill in the 1997 Hawaii Legislature to grant DLNR authority to issue recreational marine licenses was defeated.

3. **The HDAR should continue to improve the collection of Hawaii fisheries data so that the data provide useful information on fishing effort.**

   Status: The HDAR is using a new database structure that includes the start and end dates of trips, if the fishermen report them. The HDAR is now considering substantial changes to the catch reporting system that should result in vastly improved catch and effort reporting from commercial fishermen.

4. **The three fishery management councils with Pacific jurisdiction, along with member states and NMFS, should collaborate to ensure the collection of landing and logbook data from all domestic longline and driftnet vessels harvesting swordfish and other Pacific Pelagic Management Unit Species (PPMUS)**

   Status: The NMFS Southwest Region (Long Beach) has agreed to provide annual summary swordfish landings data from the PacFIN data base covering Washington, Oregon, and California. These summaries will be included in next year's module. In

addition, Honolulu Laboratory scientists have received California longline logbook data from Cal F&G and voluntary longline logbook data received by the SWFSC-La Jolla. These data will be summarized for Pelagics Plan Team review later in the year. Finally, the Pacific States Marine Fisheries Commission provided Honolulu Laboratory scientists with annual vessel summary data for the west coast from 1987-1993. These data will also be summarized for the Pelagics Plan Team later in the year.

5 **The Council should support an analysis of trends in mahimahi and ono landings and catch rates, and other incidental catches, throughout the western Pacific region, including data from EEZ and distant-water fisheries.**

Status: The team retained this recommendation because nothing specific had yet been done along these lines, and it is still an identified need. It was suggested that PFRP solicit project proposals for this work next funding cycle becomes available.

6. **The Council should attempt to obtain data on discards from U.S. and other purse seine fisheries within the U.S. EEZ and on the high seas.**

Status: A new "International Fisheries" module will be added to the 1996 Annual Report summarizing pelagic catches in the high seas of the North Pacific Ocean. Data for the South Pacific will be added next year. Data on discards from the U.S. and other purse seine, as well as other pelagic fisheries, are still missing.

Plan Administration

Administrative Activities

No FMP or regulatory amendments governing the western Pacific pelagic fisheries were proposed by the Western Pacific Regional Fishery Management Council during 1996; hence, no regulatory action related to the pelagics FMP was required by the NMFS Southwest Region (SWR).

Longline Permits

The SWR Pacific Area Office (PAO) issued/renewed 164 Hawaii longline permits and 29 western Pacific general longline permits for American Samoa, Guam, and Northern Marianas Islands. There were 45 Hawaii longline permit transfer transactions, 8 more transfers than the previous year.

In 1996, 14 percent (23) of the Hawaii longline permits were held by persons who did not own vessels as allowed under the limited entry program. These permit holders held "non-valid

longline permits" that could be validated (i.e., registered to fishing vessel) at a later date by presenting to NMFS a U.S. Coast Guard certificate of documentation verifying ownership of a vessel. The names of vessels registered with Hawaii longline permits and permit holders with and without vessels are listed on page 16.

Foreign Fishing Permits

No administrative actions relating to foreign fishing in the western Pacific EEZ were required because no foreign fishing permits were requested for any vessels with which the USA has a Governing International Fishing Agreement.

Table 3. 1996 Hawaii Longline Limited Entry Permit Holders

F/V AHI	Gerald Shimabukuro
F/V ALEUTIAN SPRAY	Krist Knutsen/D. Gunn
F/V ALYCIA MARY	C & M Fisheries Inc.
F/V ANNA	MTA Corp.
F/V ARROW	David Kelly
F/V AUKAI VI	Ralph Takafuji Sr.
F/V B-52	B-52 Inc.
F/V BARBARA H	Arthur/Barbara Haworth
F/V BIG AL	R & R Fisheries Inc.
F/V BIG DEAL	Roy-Al Boat Mgmt.
F/V BLUE DECEMBER	Peter I Corp.
F/V BLUE DRAGON	B Dragon Corp.
F/V BLUE FIN	Liet An Lu/Mai Thi Do
F/V BLUE HORIZON	Phon Do
F/V BLUE SKY	Blue Sky Fishing Prod
F/V BRANDI	Success Inc.
F/V CAPT. DAVIS	Ho Son Nguyen
F/V CAPT. DIAMOND	Capt. Diamond Inc.
F/V CAPT. GREG	Aquanut Co. Inc.
F/V CAPT. LE	Capt. Le Inc.
F/V CAPT. MILLIONS I	Nga Van Le
F/V CAPT. MILLIONS III	Capt. Millions III Inc.
F/V CAPT. MILLIONS IV	H and M Fishery Inc.
F/V CAPT. WASHINGTON I	Capt. Washington I Inc.
F/V CORI DAWN	Cori Dawn Corp.
F/V CRYSTAL	F/V Crystal Inc.
F/V DAE IN HO	KYL Inc.
F/V DAEINHO III	Chunha Inc.
F/V DASHER II	DukSung Fishing Inc.
F/V DAWNING STAR	Larry B. & Dawn Powers
F/V DEBORAH ANN	Amko Fishing Co. Inc.
F/V DOUBLE D	Joseph Dettling
F/V E.T.	Vessel Mgmt. Assoc.
F/V EDWARD G	Edward G. Co. Inc.
F/V ESTHER I	Yong Sang Kim
F/V FINBACK	Finback Inc.
F/V FIREBIRD	Firebird Fishing Corp.
F/V FRIENDSHIP	Alvin Tran Inc.
F/V FULL MOON	R.A.R. II Fisheries
F/V GAIL ANN	Gail Ann Co. Inc.
F/V GARDEN SUN	Muoi Peter Ngo
F/V GLORY	Roy Yi
F/V GOLDSTAR	Sapphire USA Inc.
F/V GRACE	Sang Yeol Kim
F/V HANA LIKE	Hana Like Inc.
F/V HAVANA	Thomas Webster
F/V HEOLA	H & M Marine Inc.
F/V HOKUAO	White Inc.
F/V I'OLANI	Jeta Inc.
F/V INDEPENDENCE	Independence Inc.
F/V INTERNATIONAL	International Boat Inc.
F/V JAGUAR T-L	Jaguar Inc.
F/V JANTHINA	Trans World Marine Inc.
F/V JI YONG	Hyon Su Oh
F/V JOHN KENNEDY	Kinh Nguyen
F/V KAIMI	James Cook
F/V KASATKA	Artemon Basargin
F/V KATHERINE II	K.A. Fishing Co. Inc.
F/V KATHERINE Y	Song Fishing Corp.
F/V KAY	K.Y. Fishing Inc.
F/V KELLY ANN	Kelly Ann Corp.
F/V KENG JIN	Konam Fishing Co., Inc.
F/V KILAUEA	Aukai Fishing Co.Ltd.
F/V KIM THANH I	Kim Thanh I Inc.
F/V KIMBERLY	Sang Van Tran
F/V KIMMY I	Kim Tran
F/V KING DIAMOND II	Scotty Nguyen
F/V KINUE KAI	Awahnee Oceanics Inc.
F/V KOLEA	Paik Fishing Inc.
F/V LADY ALICE	Lady Alice Co. Inc.
F/V LADY AUD	Richard Enslow
F/V LADY CHRISTINE	Christine Tran
F/V LADY CHRISTINE II	Christine Tran Inc.
F/V LADY CHUL	Jong Ik Fishing Co.
F/V LADY LYN III	Lady Lyn Inc.
F/V LEA LEA	Jeta Inc.
F/V LIBERTY	Yu & AAS Corp.
F/V LIHAU	White Inc.
F/V LILA	Samuel Lee
F/V LINNEA C	Linnea C. Inc.
F/V MAN SEOK	KMC & PCC Inc.
F/V MANA LOA	Hawaii Protect Assc Lt
F/V MARIE M	Viking V Inc.
F/V MARINE STAR	Viking V Inc.
F/V MIDNIGHT II	Albert K. Duarte
F/V MISS AGGIE N	Miles Gould
F/V MISS FRAN	Impetuous Inc.
F/V MISS JESSICO	Pacific Seafoods Inc.
F/V MISS JULIE	Quan Do
F/V MISS LISA	Miss Lisa Inc.
F/V MISS VIVIANA	N.Hai Thanh/Reagan/Duoc
F/V MOKULELE	Robert Cabos
F/V MORGAN 5	Steven Ho
F/V NATALIE ROSE	Charles A. Dye
F/V NAVIGATOR	Warren&Vincent Ent Inc.
F/V NEW HORIZON	John D. Gibbs
F/V NORPAC	George Rains Jr.
F/V NORTHERN VENTURE	L & B Fisheries Inc.
F/V OCEAN DIAMOND	Ocean Diamond Inc.
F/V OPAL IMAGE	Pacific Fishing Supply
F/V PACIFIC DREAM	Pacific Seafoods Inc.
F/V PACIFIC FIN	Fishrite Inc.
F/V PACIFIC HORIZON	John Gibbs
F/V PACIFIC PRIDE	Pacific Seafoods Inc.
F/V PAN AM II	Pan Am K Marine Corp.
F/V PARADISE QUEEN II	Katrianna Pacific Corp.
F/V PEARL HARBOR II	Gilbert DeCosta
F/V PETITE ONE	Ka'upu Ltd.
F/V PHI NAM	Pilgrim Truong
F/V PRINCESS K	Princess K Fishing
F/V QUEEN DIAMOND	Santa Maria III Inc.
F/V RED DIAMOND	Xuan Nguyen
F/V RED OCTOBER	Pacific Fishing Supply
F/V ROBIN	Fat City Fishing

F/V ROBIN II	Robin Fishing Inc.
F/V SANDY DORY	Highliner Inc.
F/V SAPPHIRE	Hanh Thi Nguyen
F/V SEA BIRD	Ly Hoa Van
F/V SEA DIAMOND	Nancy Nguyen
F/V SEA DIAMOND II	Sea Diamond II Inc.
F/V SEA DRAGON	Long Thanh Nguyen
F/V SEA FLOWER	Sea Flower Inc.
F/V SEA HAWK	Hawaii Fishing Co.
F/V SEA SPRAY	Parker Seafoods, Inc.
F/V SEASPRAY	Hanson/Hanson Fishing
F/V SEEKER II	Seeker Fisheries Inc.
F/V SEVEN STARS	Kwang Myong Co. Inc.
F/V SOUTH PACIFIC	South Pacific Fishing
F/V SPACER K	Hwa Deog Kim
F/V SUN FLOWER #1	TX, Inc.
F/V SUN STAR	Sun Fishing Co. Inc.
F/V TIFFANY VANCE	Tiffany Vance Inc.
F/V TOURANE	Danang Enterprise, Inc.
F/V TUCANA	Pacific Boat Corp. Inc.
F/V ULHEELANI	Ulheelani Corp.
F/V VAN LOI	Van Loi Corp.
F/V VICTORIA	Victoria Inc.
F/V VOSTOK	Evgeny Basargin
F/V VUI-VUI	Santa Maria III Inc.
F/V WHITE NIGHT	Natalia/Kiril Basargin
F/V WONIYA	Sierra Fisheries Inc.

No Vessel:

M&T Fishing Co. Inc.
James Welch
Vedoy Enterprises Inc.
James Chan Song Kim
Master Vincent Inc.
Shaman Partnership
Theodore Benjestorf
H&M Marine Inc.
Pacific Ocean Producers
Che Kun Kim
John Romero
John Romero
CKM Inc.
K&S Fisheries Inc.
Tuyet Mai McDowell
Henry Niemi Jr.
Ocean Associates Corp.
Minh Hoang Dang
Kevin Van
Vessel Mgmt Assoc.
Hanh Thi Nguyen
Henry Niemi Jr.
Eric Yu

Protected Species Conservation

The Hawaii longline fishery has been monitored under a mandatory observer program since February 1994 following a voluntary program in earlier years. During 1996, the SWR Observer Branch placed observers on Hawaii-based longline vessels covering 52 trips. A total of 624 sets were observed or a total fishing effort of 731,687 hooks deployed, and 50 interactions with turtles were observed. This represents a cumulative interaction rate of 0.0683 per 1000 hooks as opposed to 0.047 per 1000 hooks in 1995. A summary of the observed interactions is given Table 4.

Table 4. Summary of observed turtle interactions with the Hawaii longline fishery in 1996.

Turtle species	Hooked			Entangled	Dead	No information
	Ingested	External	Unknown			
Loggerhead	13	10	2			1
Olive Ridley	6	2			1	
Leatherback		4		1	1	3
Green		3				
Unidentified hard-shell	2		1			

Just over half of the interactions (26) involved Loggerhead turtles, with most of the remainder comprising Olive Ridley and Leatherback turtles. Most interactions (43) involved the turtles being hooked, rather than entangled in the longline gear, and with 21 animals hooked internally, through ingestion of the hook, versus 19 hooked externally. Three turtles were hooked but with no information on whether the hook was ingested or the hook was set externally. Two turtles were dead when retrieved, while the remainder were released alive.

SWR observers also obtained turtle tissue samples for genetic analyses, tagged and photographed turtles for future identification, and collected turtle life history data when possible. During 1996 and 1997, the NMFS Honolulu Laboratory also deployed satellite tags on a number of hooked turtles to obtain more information on the post-hooking mortality of turtles following interactions with longlines. At present, the expansion of observer data to interaction totals for the entire fleet use data on post-hooking mortality from a Spanish study conducted on Atlantic turtles. Clearly more accurate information is required to develop better models for the expansion of observer data. The study is ongoing and will continue in 1997. So far about a dozen turtles have been tagged and monitored following release in 1996 and 1997.

The longline fishery also interacts with protected species of birds, namely Laysan and Black-footed albatross populations which nest in the Northwestern Hawaiian Islands (NWHI). There also 2-3 Short-tail albatross that have nested but not reared any chicks in the NWHI. All albatrosses are protected under the Migratory Bird Treaty Act, but the Short-tailed albatross is also covered under the Endangered Species Act as there are only about 800 specimens surviving world-wide. The current populations of Laysan and Blackfooted albatrosses in the NWHI number some 600,000 and 64,000 mature breeding pairs. Both albatross species become mature at around 10 years of age and the populations of immature birds <10 years of age are unknown.

While neither Laysan and Black-footed albatross populations are in any immediate danger, the level of interaction and mortality with the Hawaii-longline fishery continues to be of great concern. A total of 31 Laysan and 59 Black-footed albatross were observed to be killed during longline operations in 1996, which represents a hooking rate of 0.097 per 1000 hooks and 0.181 per 1000 hooks respectively. As with the turtle observer data, the observations on albatross can be extrapolated to the entire longline fleet and the estimated annual fleet-wide mortalities for both Laysan and Black-footed albatross are given in Table 6[9].

Table 6. Estimated annual fishery induced mortality of albatross in the Hawaii-based longline fishery

	1994	1995	1996	Average
Laysan Albatross	1,020	1,942	508	1,156
95% conf. limits	381 - 1659	0 - 4377	224 - 817	
Blackfoot Albatross	2,135	1,796	991	1,640
95% conf. limits	1164 - 3105	298 - 3294	718 - 1411	
Total	3,155	3,738	1,499	2,797

There was a large reduction on the estimated number of birds killed by the longline fleet in 1996, but this is not thought to be due to activities by fishermen to mitigate bird mortality. More work will be conducted by the Council and USFWS during 1997 to ascertain what, if any, mitigation methods and techniques are being employed by longline fishermen and how effective these appear to be. The NMFS observer form for the Hawaii longline fishery will also be modified during 1997 to permit observers to make records of mitigation methods employed by fishermen and their efficacy.

[9] Dr. Pierre Kleiber, NMFS Honolulu Laboratory, pers comm.

The fleet-wide expansion of the observer data for takes and kills of turtles in the Hawaii longline fishery from 1994 to 1996 is shown in Table 5[8]. Also shown in this table are the allowable take and kill levels as determined from 1994 biological opinion under Section 7 of the Endangered Species Act. These figures are the best estimates available for the acceptable levels of longline fishery interactions and mortality without jeopardy to the turtle populations. If these allowable take and kill levels are exceeded then a new Section 7 consultation is triggered, as indeed has been the case for Loggerhead turtles in 1995 and 1996. The new biological opinion is expected to be produced by NMFS towards the end of 1997.

Table 5. Estimated fleet-wide turtle takes and kills in the Hawaii longline fishery, 1994-1996

Species	Allowable take	Estimated take		
		1994	1995	1996
Loggerhead	305	301	339	358
95% conf. limits		212 - 447	225 - 476	237 - 481
Olive Ridley	152	120	123	129
95% conf. limits		60 - 179	66 - 184	68 - 193
Leatherback	271	132	156	159
95% conf. limits		87 - 202	103 - 239	104 - 243
Green	119	34	41	42
95% conf. limits		15 - 81	18 - 96	18 - 97

Species	Allowable kill	Estimated kill		
		1994	1995	1996
Loggerhead	46	51	57	60
95% conf. limits		36 - 75	38 - 80	40 - 81
Olive Ridley	41	32	33	34
95% conf. limits		0 - 47	18 - 49	18 - 51
Leatherback	23	9	11	11
95% conf. limits		0 - 14	7 - 16	7 - 16
Green	18	0.7	0.8	0.8
95% conf. limits		0 - 2	0 - 2	0 - 2

[8] Dr. Pierre Kleiber, NMFS Honolulu Laboratory, pers comm.

USCG and NMFS Enforcement Activities

The following report is a combined effort of the U. S. Coast Guard (USCG) 14th District and the National Marine Fisheries Service (NMFS) Southwest Region Office of Enforcement. The report covers the period 1 January 1996 through 31 December 1996.

USCG Enforcement Activities

The USCG conducted 1,500.6 hours of fisheries patrols with C-130 aircraft in the central and western Pacific region during 1996. The C-130 surveillance of U. S. EEZ's was broken down as follows: 186.6 hours in the Main Hawaiian Islands, 231.4 hours in the Northwest Hawaiian Islands, including Hancock Seamount, 368.0 hours in Guam and Commonwealth of the Northern Mariana Islands (CNMI), 7.6 hours in Johnston, 265.6 hours in Palmyra/Kingman Reef, 179.1 hours in Jarvis, 101.9 hours in Howland/Baker, and 40.0 hours in Wake. There were also 120.4 hours expended on high seas driftnet enforcement. The Coast Guard flew 521.1 hours with HH-65 helicopters in support of fisheries law enforcement; this effort was concentrated in the Main Hawaiian Islands. During calendar year 1996, 162 high endurance cutter days were utilized patrolling District 14's waters.

In 1996, there were 474 total fishing vessels sighted within District 14's boundaries. Of these vessels, 208 were boarded. A breakdown of the vessels boarded is as follows: 129 were U. S., 23 were Japanese, 47 were Taiwanese, four were South Korean, three were Panamanian, one was Chinese, and one was Canadian.

There was one significant non-VMS MSFCMA law enforcement case relating to pelagic fisheries that was prosecuted by the Coast Guard in 1996. The following information applies:

> On September 14, 1996, CGC GALVESTON ISLAND intercepted the FF/V TAIKO MARU (JA) approximately 3nm inside the southeastern U. S. EEZ of Guam. After approaching the TAIKO MARU, it was observed that the vessel was actively engaged in fishing; a boarding ensued shortly thereafter. A Statement of No Objection (SNO) was processed and approved for the vessel and its catch to be seized in violation of the Magnuson Act. The vessel was escorted to Guam and the case turned over to NMFS for further prosecution. The case resulted in a $62,000 fine for the vessel's owner and the requirement for the vessel to carry a VMS transponder for worldwide tracking over the next five years.

Meetings and Conferences

Throughout 1996, the 14th District Law Enforcement staff actively participated in meetings and conferences in support of living marine resources. The events varied in focus from local public hearings to international multi high level conferences and issues ranged from biological sustainability to multi-agency international enforcement. The Coast Guard will continue its

Habitat Protection

There is no information to suggest that the habitat of pelagic management unit species was subjected to major alterations in 1996. However, a major El-Nino-Southern Oscillation (ENSO) event commenced in the tropical Pacific towards the end of 1996 and beginning of 1997, and this will likely have possible long-term effects in 1997 onwards. The continuing introduction of low-level pollution from diverse sources, however, combined, with occasional pulses at higher levels, is an ongoing problem. Pollution sources include runoff from high islands, sewage from island outfalls and ships, oil from ship bilges and accidental spills, hazardous waste spills, and marine debris originating from land or ships in the region, or drifting in from other areas.

active engagement in key meetings and conferences in order to interact with the local and international fishing communities, and ensure proposed regulations are enforceable and maintain a safe level playing field for all participants.

Partnerships

In 1996, the USCG worked to strengthen its partnerships with other agencies. The Coast Guard pledged formal support to the State of Hawaii's Division of Conservation and Resource Enforcement (DOCARE) to assist the State in enforcement efforts of its pending bottomfish regulations. In addition, the Coast Guard provided fisheries training to Maui-based DOCARE agents, fostering closer working relations between the two agencies. The Coast Guard also provided general and fisheries law enforcement instruction to enforcement officials from Guam, Commonwealth of the Northern Mariana Islands (CNMI), Palau, and the Federated States of Micronesia (FSM). Internationally, the 14th District fostered partnerships with Australia and New Zealand by formally sharing the USCG's cutter and aircraft patrol schedules with the two countries in an effort to promote regional enforcement in the central/western Pacific. The 14th District also passed sighting information from USCG units of FF/Vs operating in Pacific Island nation
EEZs to the Forum Fisheries Agency (FFA); the FFA then coordinated efforts with the respective nation to verify the FF/Vs had current fisheries permits.

Vessel Monitoring System

The Vessel Monitoring System (VMS) owned and operated by the NMFS and monitored jointly by NMFS and USCG personnel has proven to be an outstanding surveillance/enforcement tool. In 1996, there were three significant enforcement cases initiated by VMS information; there have been nine total cases initiated by VMS since the system was implemented for the Hawaiian Islands domestic longline fleet in December 1994. Using "signature analysis," Coast Guard and NMFS personnel identified the possibility that longline fishing was conducted in restricted areas (Longline Closure Area and the Northwest Hawaiian Protected Species Zone) around the Hawaiian Islands. The information was passed to Coast Guard surface units which conducted at sea boardings to investigate the information. The following information applies:

> On July 14, 1996, the F/V ULHEELANI was observed on VMS conducting fishing operations near the Main Hawaiian Islands (MHI) Longline Closure Area. A portion of ULHEELANI's track entered the Longline Closure Area, and it was not immediately determinable if an incursion had transpired. The information was passed to NMFS for a dockside boarding. On July 17, NMFS boarded F/V ULHEELANI and a review of the vessel's logs revealed that the vessel did fish inside the Longline Closure Area during the time in question.
>
> On August 10, 1996, CGC WASHINGTON boarded the F/V SAPPHIRE. SAPPHIRE's track on VMS indicated the possibility that longline gear may have been set within the MHI Longline Closure Area on August 7-8. A review of F/V SAPPHIRE's NMFS

fishing logbook did not indicate fishing inside the closure area. However, a 15-40 nm discrepancy between logged positions and VMS positions was identified, and the logbook indicated that fishing activity occurred during the periods VMS plotted the vessel inside the closure area. F/V SAPPHIRE's GPS was confirmed to be working properly. The WASHINGTON issued a violation to the SAPPHIRE for fishing inside the closure area and falsifying logbook entries. Due to the completeness of the on scene investigation and the fact that the remainder of the vessel's voyage could be tracked via VMS, the SAPPHIRE's voyage was not terminated.

On December 3, 1996, F/V DAWNING STAR was observed on VMS as possibly having conducted longline fishing inside the MHI Longline Closure Area December 2-3, 1996. CGC ASSATEAGUE intercepted and boarded the vessel December 4, 1996. During the boarding, evidence was obtained which indicated the DAWNING STAR had fished illegally inside the longline closure area on two separate occasions. The DAWNING STAR was issued a violation for its unlawful activity; due to the completeness of the on scene investigation as well as the ability to monitor the vessel on VMS, the vessel was allowed to continue its fishing trip.

NMFS Enforcement Activities

Magnuson Fisheries Conservation and Management Act (MSFCMA)

Hawaii is the home for approximately (domestic) 105 longline fishing vessels, 15 bottomfish vessels and 10 lobster vessels. The longline fishing vessels target pelagic species of swordfish and tuna, while the bottom fishers target species of the snapper family. As a result of gear interaction between endangered Hawaiian Monk Seals as well as gear interaction between commercial longliners and near shore fishing entities, several prohibited fishing zones were created. In total, six distinct fishing zones and three distinct fishing seasons are currently in place to regulate fishing operations within the Hawaiian Island chain.

In order to seek a high degree of compliance within the regulated fisheries, over 100 longline vessels have been equipped with a Vessel Monitoring System transceiver (VMS). The VMS transceiver provides the Hawaii Field Office of Enforcement with the ability to actively monitor the fishing fleet with "real-time" position reports in order to ascertain a vessel's position relative to the prohibited fishing zones and seasonal changes. As a result, violations within the prohibited fishing zones have been reduced from a high of 8-10 violations per year to just 3 violations for 1996. The VMS program has proven to be a cost effective and efficient means of enforcement and is at present the only fully operational fisheries enforcement program in the United States. Highlights for Hawaii:

- Over 150 boardings of domestic and foreign fishing vessels
- Increased compliance with fishing regulations pertaining to prohibited fishing zones
- Use of VMS to receive catch log data for the lobster fishery (voluntary) which resulted in a recommendation by the Western Pacific Fisheries Management Council (WPFMC) to include VMS as a viable reporting option for the lobster fishery
- On-site VMS Manager (contract awarded)
- Increased VMS recognition within the Pacific Ocean area.

American Samoa has experienced a substantial increase in fishing activity as the local fishing fleet has re-geared to horizontal longline gear as opposed to vertical longline gear. The local fleet is predominantly targeting smaller tuna such as albacore for sale at the cannery located in Pago Pago. Approximately 15-20 vessels have made the change from vertical to horizontal longline gear. A number of foreign vessels (longline tuna vessels) continue to offload to the cannery, resupply and conduct repairs in American Samoa. Highlights for American Samoa:

- Education and community outreach interaction between the local fleet and the Office of Enforcement utilizing principles of the Voluntary Compliance Program (VCP)

- Development of data log sheets and catch information locations between the Office of Enforcement, the Pacific Area Office and the local fishing fleet resulting in a smooth transition for the local fleet to a highly regulated fishery
- Issuance of "Fix-it Notices" utilizing principles of the VCP with successful results. Both "Fix-it Notices" were immediately corrected by the vessel owners
- Established and fully operational working "cooperative agreement" between the Office of Enforcement and the American Samoa Government Department of Marine and Wildlife Resources resulting in three officers assigned to assist the Office of Enforcement
- Over 160 boardings of domestic and foreign fishing vessels

Guam continues to experience ongoing activity with a number of foreign vessels offloading and bunkering in Agana. The daily flights and good infrastructure, Guam will only expand in it's role as a leading port in the South Pacific. Highlights for Guam:

- Continued vessel monitoring of several foreign fishing vessels using technology based on the VMS system in Hawaii

Lacey Act

The Office of Enforcement is past its second year with a senior investigator stationed in Honiara, Solomon Islands as a technical advisor to the Forum Fisheries Agency (FFA). The FFA is comprised of several Island Country Nations that have formed a regulatory body to provide uniformity to fisheries regulations, licenses, permits and enforcement actions within the various Island Nations Exclusive Economic Zones (EEZ). The Office of Enforcement has provided valuable technical assistance as well as referring several violations to the FFA for further investigation. During 1996, investigators in American Samoa and Guam have provided the following to the FFA:

- Technical assistance and training in fisheries enforcement techniques, operations and investigations for all Island Nations
- Assisted with FFA investigations in American Samoa
- Referred to the FFA for further investigation, a document forgery scheme to obtain valid foreign fishing licenses with fraudulent documents as a result of a boarding conducted in Guam by the Office of Enforcement investigator

1996 Statistics

A total of 106 Complaints were received by the Hawaii Field Office of Enforcement.

A total of 159 Dockside boardings were conducted in Honolulu.

A total of 164 Dockside boardings were conducted in American Samoa.

A total of 16 investigative cases were opened in 1996.

Appendix 1

Territory of American Samoa

Introduction

The pelagic fishery in American Samoa has historically been an important component of the traditional domestic fisheries. The fishery was first monitored in the mid 1970s and has operated on a similar small scale since that time. Prior to 1985, only commercial landings were monitored. From October 1985 to the present, data were collected through a creel survey that included subsistence and recreational fishing as well as commercial fishing. In 1996 45 vessels participated in the fishery.

Prior to 1995 the pelagic fishery was largely a troll-based fishery. In mid-1995 four vessels began longlining and since that time 10 vessels have applied for permits to longline. This method of fishing was introduced to the Territory by Western Samoan fishermen a few years ago. Local fishers obtained the gear and employed Western Samoan fishers until they themselves became familiar with it. The fishers have found longlining to be a worthwhile venture to engage in because they catch more fish with less effort and use less gas for trips. The vessels most frequently used are the "alias", twin-hulled wood (with fiberglass or aluminum) boats about 30 feet long, and powered by small gas outboard engines. There is also a 66 foot long, concrete hull jig-boat that obtained a longline permit for 1997. Navigation on the vessels is visual, using landmarks. The gear is stored on deck on a hand-crank reel which can hold as much as 10 miles (25 miles for the jig-boat) of monofilament mainline. An average of 188 hooks per vessel per fishing-day are set. The gear is set by spooling the mainline off the reel and retrieved by hand-cranking the mainline back onto the reel. Trips are a day long (about 8 hours). Setting the equipment generally begins in the early morning; haulback is generally in the mid-day to mid-afternoon. The catch is stored in boxes built into the hull of the boat. Albacore tuna is the primary species caught, and is generally stored in personal freezers until a sufficient amount is accumulated to sell to the canneries. Some of the catch is also sometimes sold to restaurants, locals and donated for family functions.

The island of Tutuila is also a major base for the trans-shipment and processing of tuna taken by the high-seas longline and purse seine fleets. The domestic pelagic fishery is monitored by the Department of Marine and Wildlife Resources (DMWR), through a program established in conjunction with the Western Pacific Fishery Information Network. This report was prepared by DMWR using information obtained by surveying pelagic fishing activities throughout the year. It does not contain information from tournament catches. This report partially fulfills the national standard requirement for a Stock Assessment and Fishery Evaluation (SAFE) report.

Summary

During 1996, most indicators showed continued increases in landings and effort, largely due to an influx of longline vessels into the fishery. The estimated number of trips also increased in 1996, though effort and trips are split between longlining and trolling -- trolling effort and trips actually declined in 1996. The catch per unit effort (CPUE) was similar to previous years for all species, and landings increased accordingly, coincident with increased fishing trips. Prices for pelagic species remained relatively low in 1996, probably due to competition by the supply of frozen fish purchased or bartered from foreign longline vessels moored in Pago Pago Harbor.

Catch of albacore increased dramatically in 1996, entirely due to the influx of longline vessels, as had been hypothesized in 1995. During the last half of the 1995, four boat owners equipped existing fishing vessels with monofilament longline gear, and by 1996 13 vessels were using longline gear to fish. These vessels have been targeting albacore mostly for the cannery market and have caused the albacore harvest to increase from less than 55,000 pounds in 1995 to over 232,700 pounds in 1996.

Recommendations

1) Continue efforts to monitor the pelagic fisheries of the local fleet in American Samoa.

2) Closely monitor the longline fleet operating in the fishery.

3) Work with Central WPacFIN to develop new algorithms to incorporate longline fishing as a new stratum in the offshore survey.

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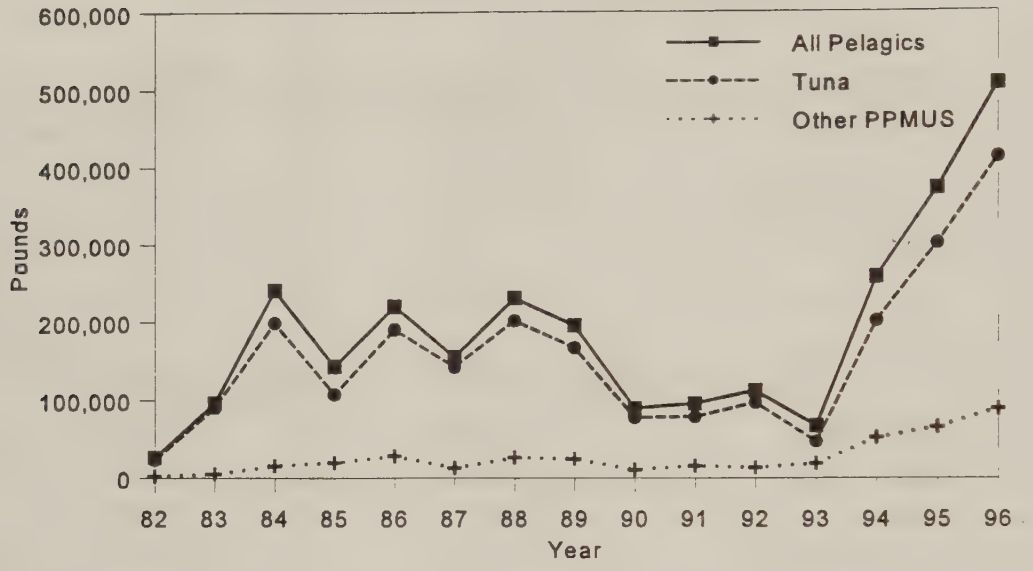
Table 1. American Samoa 1996 estimated total landings for pelagic species by gear type

Species	Longline Pounds	Troll Pounds	Total Pounds
Skipjack Tuna	610	75,357	75,967
Albacore	232,721	0	232,721
Yellowfin Tuna	28,137	65,155	93,292
Kawakawa	0	225	225
Bigeye Tuna	10,005	0	10,005
Unidentified Tunas	0	0	0
Subtotal Tunas	**271,473**	**140,737**	**412,210**
Mahimahi	5,761	7,194	12,955
Blue Marlin	22,367	15,315	37,682
Wahoo	3,895	8,091	11,986
Dogtooth Tuna	0	5,932	5,932
Sharks	8,563	4,184	12,747
Swordfish	1,332	0	1,332
Sailfish	3,087	2,448	5,535
Subtotal other PPMUS	**45,005**	**43,164**	**88,169**
Barracuda	1,475	3,056	4,531
Rainbow Runner	0	1,218	1,218
Unidentified	1,034	0	1,034
Subtotal Misc.	**2,509**	**4,274**	**6,783**
Total Pelagics	**318,987**	**188,175**	**507,162**

Table 2. American Samoa 1996 estimated commercial landings, value and average price of pelagic species.

Species	Pounds	$/lb	Value ($)
Skipjack Tuna	69,758	1.00	69,758
Albacore	232,461	1.11	257,435
Yellowfin Tuna	91,245	1.97	179,305
Kawakawa	76	0.73	56
Bigeye Tuna	10,005	2.00	20,009
Other Tunas	0	0	0
Subtotal Tunas	**403,545**	**1.30**	**526,563**
Mahimahi	11,498	1.98	22,812
Blue Marlin	30,041	1.13	33,955
Wahoo	10,858	1.03	11,209
Dogtooth Tuna	5,932	1.87	11,092
Swordfish	1,332	2.00	2,664
Sailfish	4,251	1.00	4,251
Subtotal other PPMUS	**63,912**	**1.35**	**85,983**
Barracudas	3,997	1.64	6,539
Rainbow Runner	1,218	1.14	1,388
Unidentified	NA	NA	NA
Subtotal Misc.	**5,215**	**1.52**	**7,927**
Total Pelagics	**472,672**	**1.31**	**620,473**

Figure 1. American Samoa total annual landings: all pelagics, tuna and other PPMUS

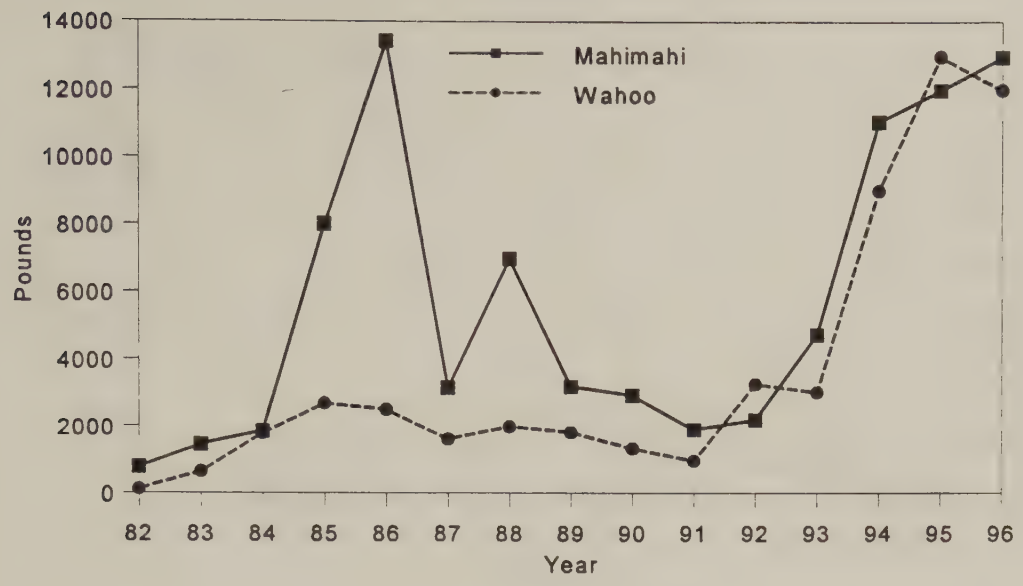


Interpretation: Estimated landings increased by 36% in 1996. Much of this increase is due to an increase in the newly emerging longline fishery. Albacore landings increased dramatically due to increased longlining effort (Figure 4), bringing up the total pelagics landings.

Calculation: Estimated landings for tuna and other PPMUS were calculated by summing the total landings for the species in each category. Estimated landings for all pelagics represent the sum of tuna and other PPMUS plus landings from the miscellaneous category (see Table 1). These figures include both commercial and recreational/subsistence components of the fishery.

	Pounds Landed		
Year	**All Pelagics**	**Tuna**	**Other PPMUS**
1982	26,396	23,042	2,106
1983	96,318	90,057	4,806
1984	241,099	198,961	15,121
1985	143,212	107,656	19,686
1986	220,063	190,621	28,046
1987	155,324	142,155	12,798
1988	230,951	201,404	25,972
1989	195,563	166,922	24,253
1990	89,240	77,213	10,288
1991	95,009	78,033	15,129
1992	111,914	96,701	13,054
1993	67,037	46,757	18,498
1994	257,859	201,097	51,672
1995	372,179	300,844	65,050
1996	**507,163**	**412,210**	**88,170**
Average	**187,288**	**155,578**	**26,310**

Figure 2. American Samoa annual landings: mahimahi and wahoo

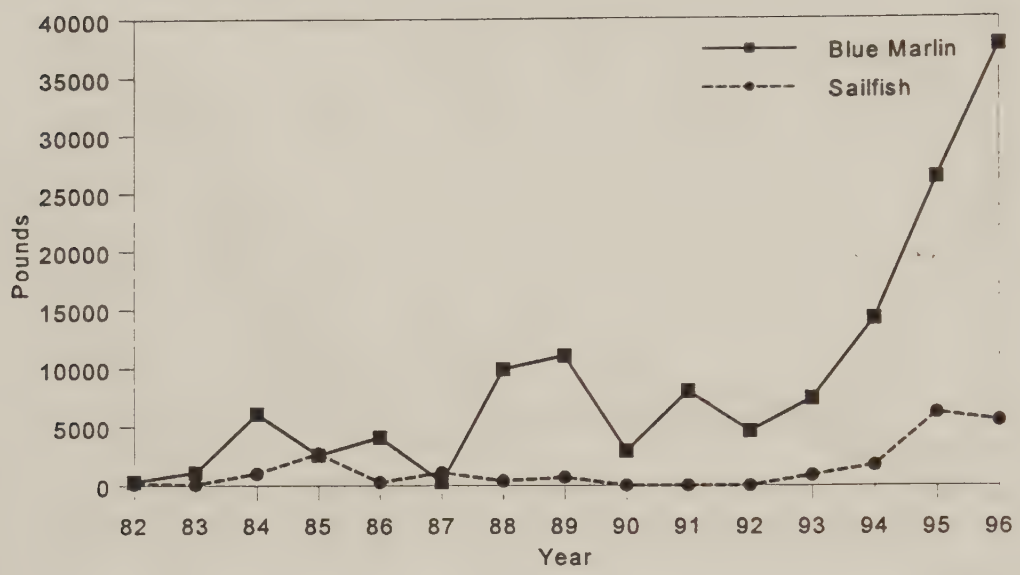


Interpretation: Mahimahi landings are variable across time for unknown reasons, but similar fluctuations occur in other WPACFIN regions. From 1984 - 1988 American Samoan fishermen exported mahimahi to Hawaii so landings were uniquely high. 1996 mahimahi landings are the largest since then, probably due to the increase in boat trips. Wahoo landings have increased notably since 1994. The small decrease in wahoo landings in 1996 is probably due to the decrease in trolling effort (Figure 7), as trolling took twice as many wahoo as longlinging (Table 1).

Calculation: Estimated landings for mahimahi and wahoo are summed for all fishing methods.

	Pounds Landed	
Year	**Mahimahi**	**Wahoo**
1982	777	114
1983	1,443	632
1984	1,844	1,777
1985	8,011	2,678
1986	13,435	2,492
1987	3,144	1,609
1988	6,976	1,981
1989	3,179	1,804
1990	2,913	1,320
1991	1,890	952
1992	2,174	3,244
1993	4,722	3,007
1994	11,048	9,000
1995	11,982	12,975
1996	12,955	11,986
Average	**5,766**	**3,705**

Figure 3. American Samoa total annual landings: blue marlin and sailfish

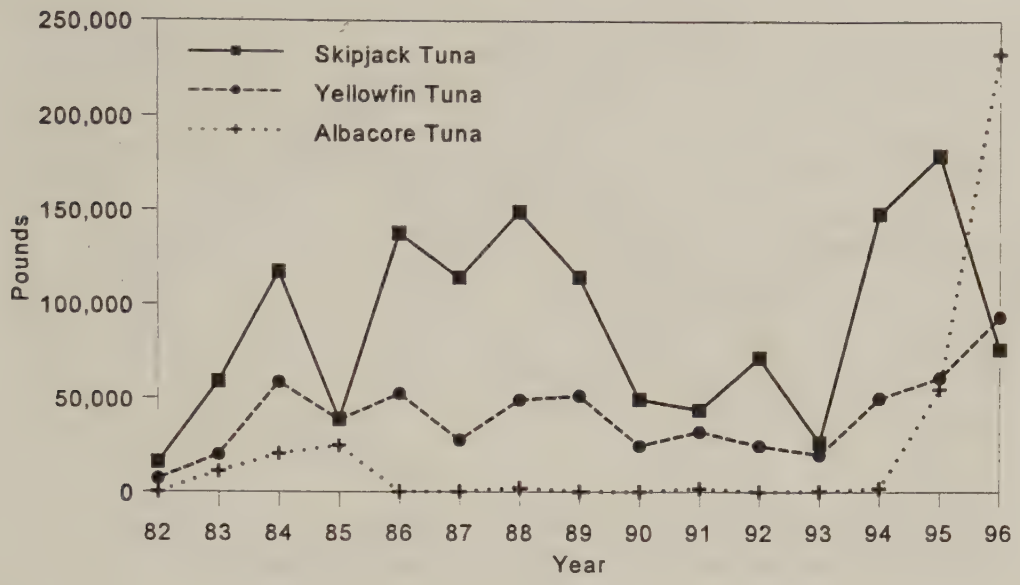


Interpretation: Increases in blue marlin landings for 1996 are probably due to increased longlining effort, as longlining took 60% of the marlin this year. Sailfish are caught more by longling (56%), which may explain the general increase in 1995-1996.

Calculation: The estimated total yearly landings of blue marlin and sailfish are summed for all fishing methods.

	Pounds Landed	
Year	**Blue Marlin**	**Sailfish**
1982	315	127
1983	1,083	74
1984	6,097	989
1985	2,574	2,744
1986	4,108	271
1987	297	1,081
1988	9,892	367
1989	11,047	687
1990	2,946	0
1991	8,012	0
1992	4,628	0
1993	7,404	873
1994	14,223	1,705
1995	26,268	6,184
1996	37,682	5,535
Average	**9,105**	**1,376**

Figure 4. American Samoa total annual landings: skipjack albacore and yellowfin tuna

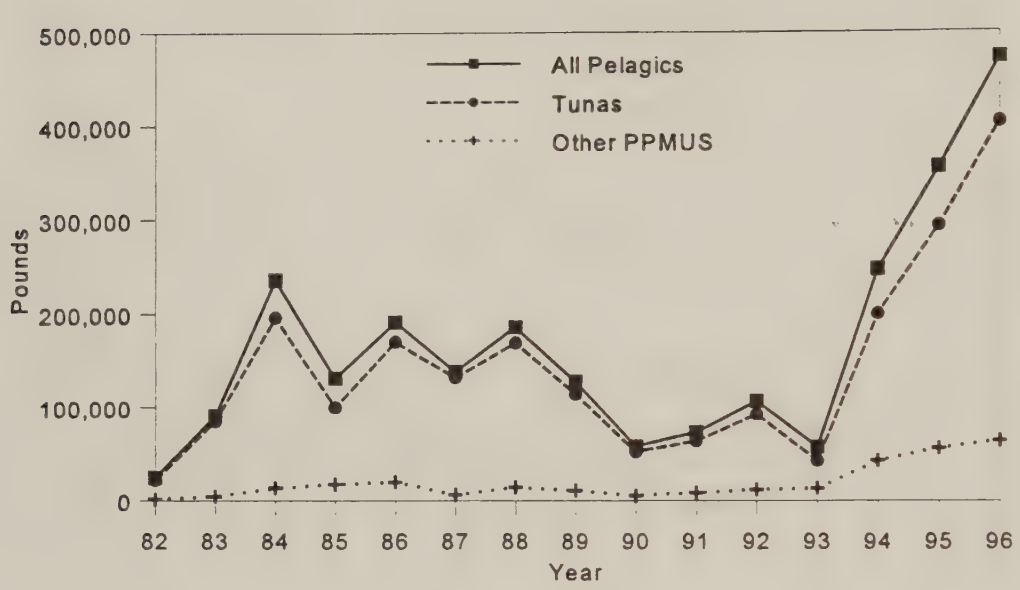


Interpretation: Dramatically increased albacore landings are due to an increase in Hawaiian style monofilament longlining that began in July and August of 1995 and continued into 1996. Longlining took 100% of the albacore during both of these years. Prior to that time, albacore was taken at low levels during occasional longlining trips. The relatively large albacore landings in 1983 - 1985 were the result of experimental fishing. No albacore were recorded as having been taken by private vessels during those years. Decreases in skipjack landings are probably due to the decrease in troll fishing in 1996 -- 99% of the skipjack were taken by trollers (Table 1). Accordingly, the slight increase of yellowfin tuna may be due to increase in longlining -- 30% of the yellowfin were taken by longliners this year.

Calculation: The estimated yearly total landings of skipjack, yellowfin and albacore tuna are summed for all fishing methods.

	Pounds Landed						
Year	**Skipjack**	**Yellowfin**	**Albacore**	**Year**	**Skipjack**	**Yellowfin**	**Albacore**
1982	15,877	7,038	0	1989	114,805	51,383	0
1983	58,997	19,789	10,904	1990	49,613	24,565	0
1984	117,693	58,704	20,390	1991	43,888	32,225	1,672
1985	38,902	38,586	24,821	1992	71,677	24,722	0
1986	138,064	52,464	0	1993	26,616	19,775	236
1987	114,381	27,627	0	1994	148,382	50,124	1,802
1988	149,416	49,159	1,884	1995	179,104	60,952	54,902
				1996	**75,967**	**93,292**	**232,721**
				Average	**89,559**	**40,693**	**23,289**

Figure 5. American Samoa annual commercial landings: all pelagic species, tunas and other PPMUS

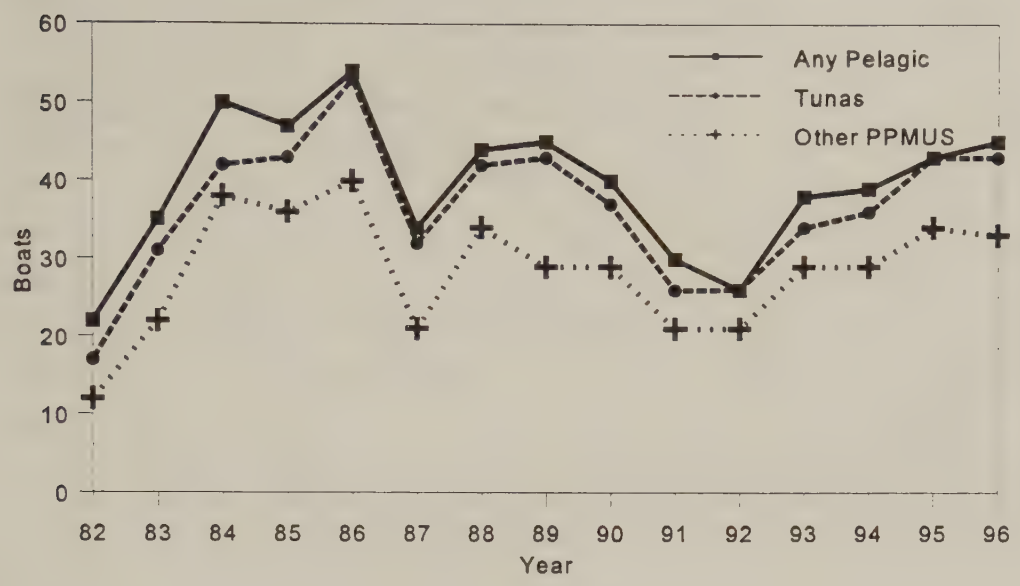


Interpretation: Commercial landings represent 89% of the landings for pelagic species in 1996, thus Figures 5 and 1 are virtually identical, as are the interpretations. Much of the increase in landings is due to an increase in the longline fishery in American Samoa.

Calculation: Estimated commercial landings for tunas and other PPMUS were calculated by summing commercial landings for the species in each category. Estimated landings for all pelagics represent the sum of tunas and other PPMUS plus landings for the miscellaneous category (see Table 1).

	Pounds Landed		
Year	**All Pelagics**	**Tunas**	**Other PPMUS**
1982	24,820	22,065	1,515
1983	90,744	85,069	4,441
1984	236,216	196,100	13,458
1985	131,310	99,987	17,515
1986	190,998	169,986	19,949
1987	137,925	131,457	6,305
1988	185,432	168,826	14,210
1989	127,560	113,904	10,745
1990	58,089	52,111	4,903
1991	73,044	63,607	8,096
1992	106,299	92,381	11,759
1993	57,184	42,573	12,945
1994	247,347	199,681	42,589
1995	355,305	293,571	55,826
1996	472,671	403,545	63,912
Average	**166,330**	**142,324**	**19,211**

Figure 6. Number of American Samoa boats landing any pelagic species, tunas and other PPMUS

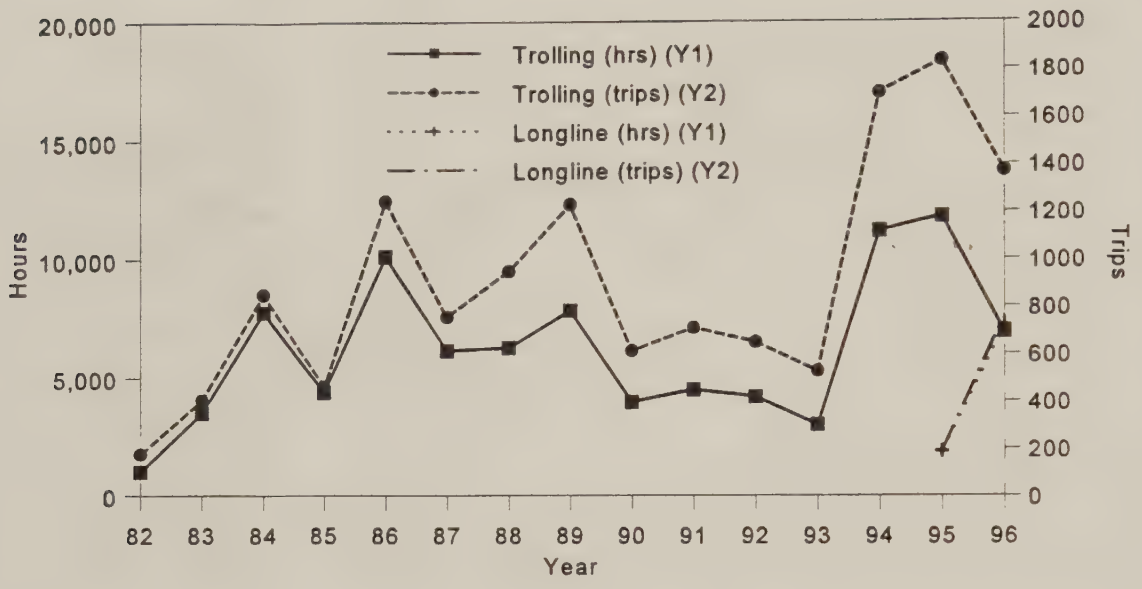


Interpretation: The number of boats participating in the pelagic fishery increased by 5% in 1996. Ten boats began longlining that year. In 1996, 13 boats used longline gear and 43 boats used trolling gear. As in past years, a small number of boats dominate the pelagic fishery, those boats being responsible for landing most of the pelagic catch.

Calculation: The sampling program is extensive enough, and the number of boats small enough, to use raw database counts of the number of vessels in a given year. When data are collected, the vessel is always identified. Each boat counted in the above table made at least one recorded landing of at least one pelagic species during a given year.

	Number of Boats landing:		
Year	**Any Pelagic**	**Tunas**	**Other PPMUS**
1982	22	17	12
1983	35	31	22
1984	50	42	38
1985	47	43	36
1986	54	53	40
1987	34	32	21
1988	44	42	34
1989	45	43	29
1990	40	37	29
1991	30	26	21
1992	26	26	21
1993	38	34	29
1994	39	36	29
1995	43	43	34
1996	**45**	**43**	**33**
Average	**39**	**37**	**29**

Figure 7. American Samoa fishing effort for pelagic species



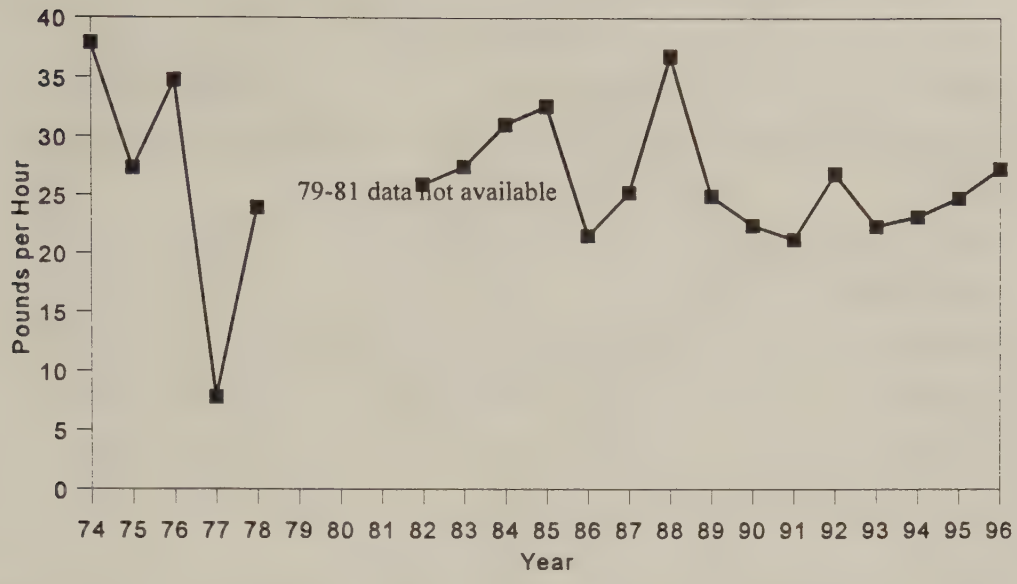
Interpretation: Fishing effort had an overall increase by 3% in 1996, though effort is now split into longlining and trolling effort. Trolling effort decline is an effect of the switch-over by vessels to longline fishing. Trolling trips averaged 5 hours in length, somewhat shorter than in previous years, and longlining trips averaged 9 hours per trip..

Calculation: For 1982 to 1994 estimated total annual landings are used as a base for estimating trolling effort. The resultant number is divided by the average trolling catch per hour (CPUE) to give an estimate of the hours trolled. Trolling CPUE is calculated using only those trips where trolling was the only method used, and for which the number of hours was recorded. The number of trips is calculated by dividing the estimated total hours of effort by the average length of a trolling trip. For 1995 and 1996 total longline landings were subtracted from the total landings prior to using the above calculation, standardizing non-longline effort to trolling effort.

Estimated Fishing Effort

				HOURS		TRIPS	
Year	**Hours**	**Trips**	**Year**	**Trolling**	**Longline**	**Trolling**	**Longline**
1982	1,019	177	1989	8,177		1,273	
1983	3,513	406	1990	4,103		631	
1984	7,785	853	1991	4,656		739	
1985	4,394	464	1992	4,178		650	
1986	10,240	1,259	1993	3,103		545	
1987	6,218	764	1994	11,453		1,738	
1988	6,421	978	1995	11,791	1,869	1,834	189
			1996	6,914	7,194	1,372	758
			Average	**6,264**	**4,532**	**912**	**474**

Figure 8. American Samoa overall pelagic catch per hour trolling



Interpretation: Total pelagic species CPUE is predominantly the combined skipjack and yellowfin CPUE shown in Figure 10, as these two species contribute 75% of the total troll catch. 1996 CPUE was slightly higher than 1995 due to increased CPUEs for mahimahi, blue marlin and yellowfin tuna. Pelagic species CPUE has been variable, especially in the early years of the American Samoa troll fishery. Low CPUE in 1977 is possibly due to small sample sizes and other data collection problems.

Calculation: For trips where trolling was used exclusively, and where effort was recorded, the total catch was divided by the total number of trolling hours to obtain CPUE. Data are from three sources; 1974-78 are from the Dory Project, 1982-84 are from the commercial catch monitoring system, and 1985-94 are from the creel survey program.

Year	lb../Hr	Trips	Year	Lb./Hr	Trips
1974	37.9	31	1987	25.2	215
1975	27.3	98	1988	36.8	276
1976	34.8	10	1989	24.9	359
1977	7.8	6	1990	22.4	280
1978	23.9	96	1991	21.2	203
1982	25.9	104	1992	26.8	204
1983	27.4	156	1993	22.3	213
1984	30.9	311	1994	23.1	379
1985	32.6	193	1995	24.7	460
1986	21.7	397	1996	27.2	357
			Average	**26.2**	**217**

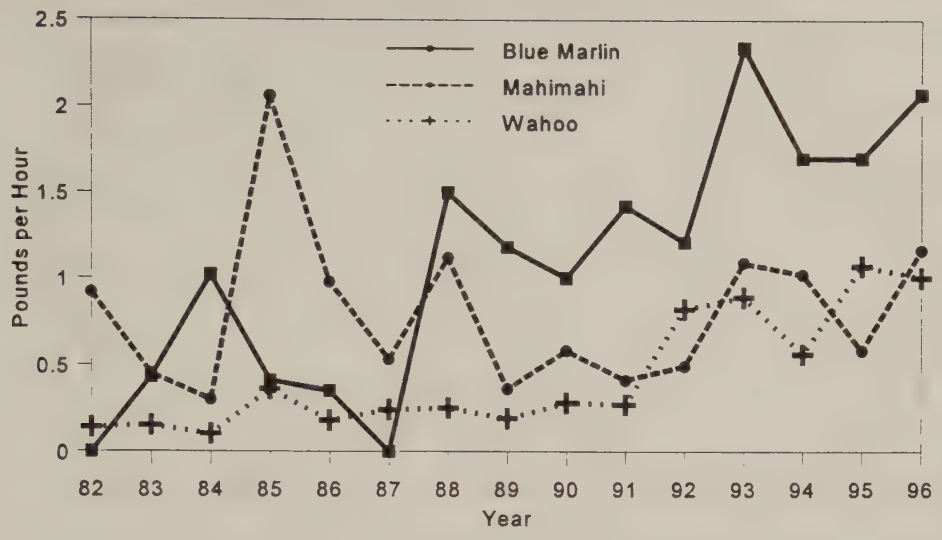
Table 3. American Samoa 1996 estimated catch rates by species for the longline fishery.

Species	Number fish per 1,000 hooks	Average lbs. per fish
Albacore	30.91	40.0
Skipjack Tuna	0.30	9.6
Yellowfin Tuna	4.09	37.9
Bigeye Tuna	1.05	52.3
Mahimahi	1.25	26.3
Blue marlin	0.90	151.8
Wahoo	0.53	43.0
Sharks	0.40	109.4
Swordfish	0.03	150.0
Sailfish	0.20	88.4
Barracuda	0.58	13.5
Unidentified	0.10	61.8
Total	**40.35**	

The longline fishery in American Samoa is a newly emerging fishery since 1995. This is the first year that we have begun to look at that fishery exclusive of the trolling fishery, so no year to year comparisons are available. It is, however, clear that the fishery expanded from 1995 to 1996: In 1995 four boats longlined in AS waters, and in 1996 thirteen boats used this method. Catch rate comparisons of the American Samoa longline fishery in 1996 to the Hawaii longline fishery in 1995 show that albacore catch is much higher in American Samoa (30.9 fish per 1,000 hooks as compared to a range of 2.13 - 3.4 fish per 1,000 hooks in Hawaii). Yellowfin tuna catch is also higher in American Samoa at 4.1 fish/1,000 hooks compared to a high of 3.4 in Hawaii (1995). Blue marlin and wahoo catch rates are in the range of the Hawaii fishery (0.51 - 1.21 fish/1,000 hooks and 0.19 - 0.61 fish/1,000 hooks, respectively). Bigeye tuna, mahimahi, swordfish and sharks had lower catch rates in American Samoa than in the Hawaii 1995 fishery.

Calculation: Total number of hooks set on 165 sampling trips were 39,860 which caught 1,609 fishes at a total of 68,629 pounds. Species CPUEs were taken from data collected during the 165 trips: the number of the species caught were divided by the number of hooks used to catch them and then multiplied by 1,000. Average pounds per species were calculated by dividing the number of total pounds of that species by the number of fish of that species caught.

Figure 9. American Samoa trolling catch rates: blue marlin, mahimahi and wahoo

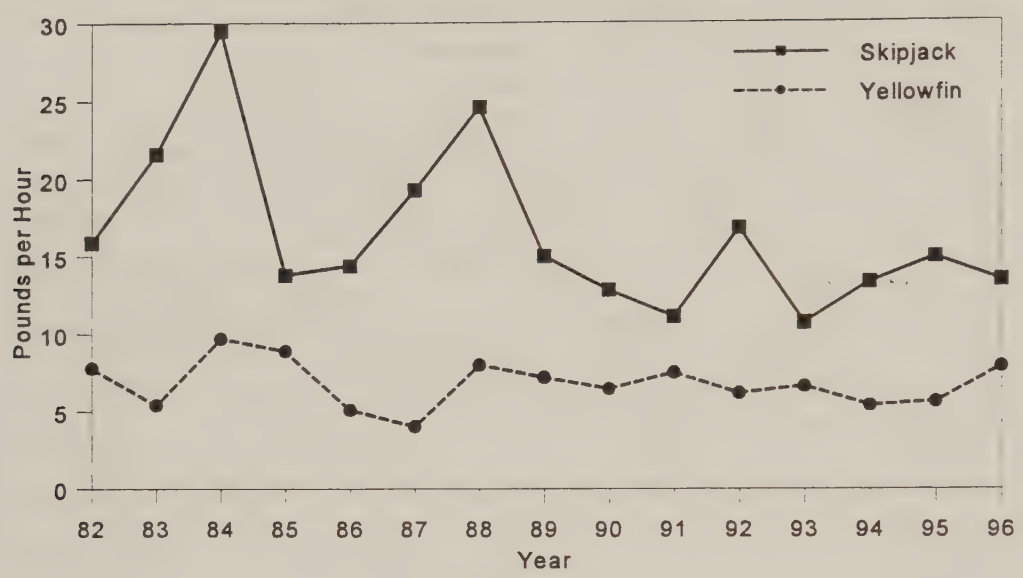


Interpretation: Blue marlin CPUE is variable but has increased over time. The variability is probably due to small number of individual fish taken, while the increase in CPUE is probably due to gear and boat improvements that have allowed fishermen to harvest these large fish. Mahimahi CPUE peaked in the mid eighties, when an export market existed for this species. Since that time, mahimahi CPUE has been variable, and without obvious trend. Wahoo CPUE has also increased over time, the reason for this increase is unknown.

Calculation: For trips where trolling was used exclusively, and where effort was recorded, the total catch by species was divided by the total number of trolling hours to obtain CPUE.

	Pounds Caught per Hour Trolling		
Year	**Blue Marlin**	**Mahimahi**	**Wahoo**
1982	0.00	0.92	0.14
1983	0.43	0.45	0.15
1984	1.02	0.30	0.10
1985	0.41	2.06	0.36
1986	0.35	0.98	0.18
1987	0.00	0.53	0.24
1988	1.50	1.12	0.25
1989	1.18	0.36	0.19
1990	1.00	0.58	0.28
1991	1.42	0.41	0.27
1992	1.21	0.49	0.82
1993	2.34	1.09	0.89
1994	1.70	1.02	0.56
1995	1.70	0.58	1.07
1996	2.07	1.16	1.00
Average	**1.09**	**0.80**	**0.43**

Figure 10. American Samoa trolling catch rates: skipjack and yellowfin tuna

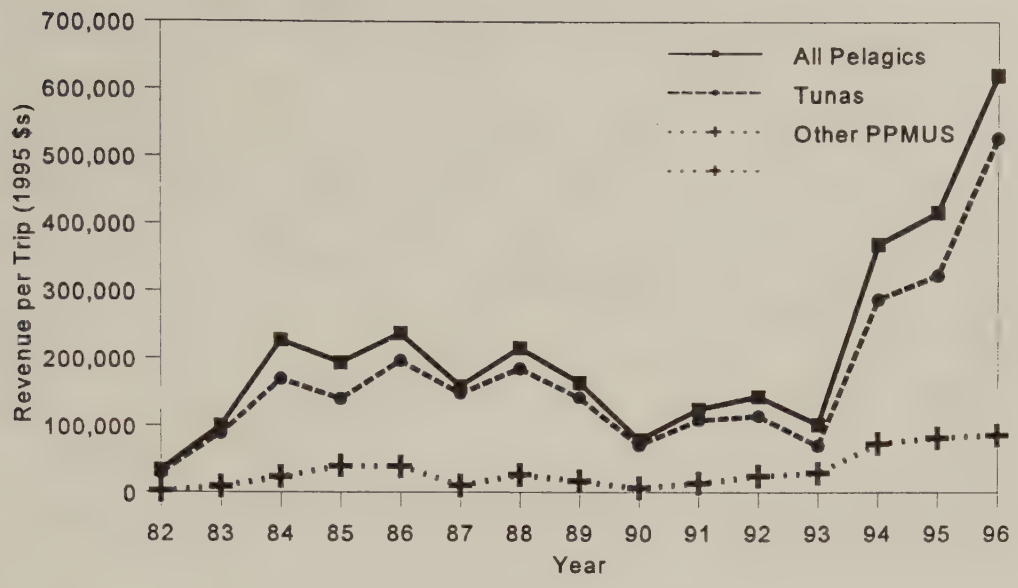


Interpretation: Skipjack CPUE has been highly variable through the years with a declining trend. Yellowfin tuna CPUE has been fairly stable over time, with only slightly higher values during the years that DMWR executed an experimental longline fishery (1983 - 1985).

Calculation: For trips where trolling was used exclusively, and where effort was recorded, the total catch by species was divided by the total number of trolling hours to obtain CPUE.

	Pounds Caught Per Hour Trolling	
Year	**Skipjack**	**Yellowfin**
1982	15.9	7.8
1983	21.6	5.4
1984	29.5	9.7
1985	13.8	8.9
1986	14.4	5.1
1987	19.3	4.0
1988	24.6	8.0
1989	15.0	7.2
1990	12.8	6.5
1991	11.1	7.5
1992	16.8	6.2
1993	10.7	6.6
1994	13.0	5.4
1995	14.9	5.6
1996	13.4	7.9
Average	**16.45**	**6.79**

Figure 11. American Samoa annual inflation-adjusted revenue for commercially landed pelagic species

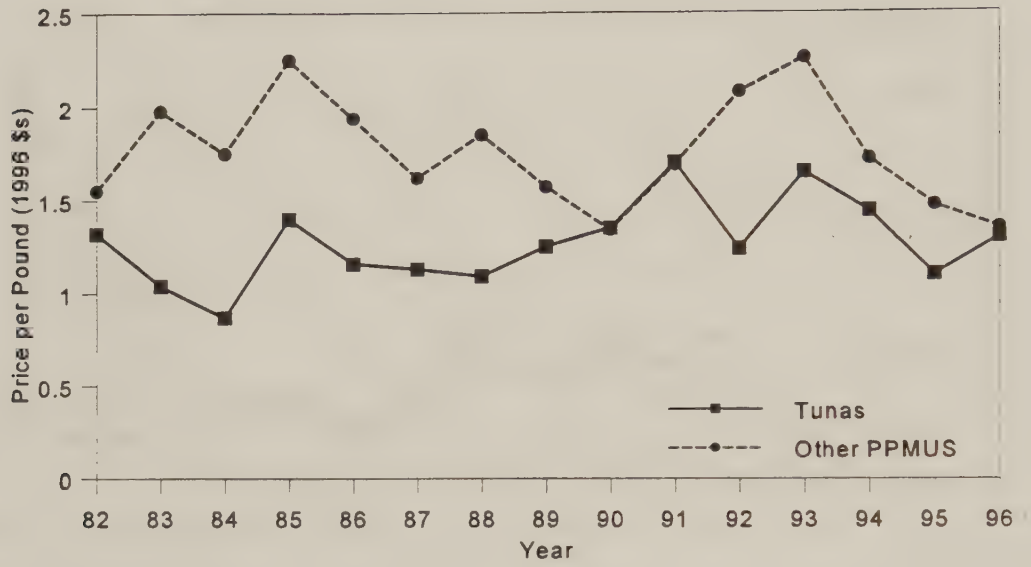


Interpretation: Striking increases in revenue from pelagic landings are due to coincident increases in catch. Fishermen actually received less per pound for tunas and other PPMUS in 1995 than in 1993 or 1994, but the price for tuna increased slightly in 1996 from 1995 (Figure 12).

Calculation: Revenues from commercial landings for all pelagic species are adjusted for inflation by multiplying a given year's revenue by the quotient of the 1996 consumer price index (CPI) divided by the CPI for that year.

	Revenue ($)					
	All Pelagics		Tunas		Other PPMUS	
Year	Unadjust.	Adjusted	Unadjust.	Adjusted	Unadjust.	Adjusted
1982	21,824	33,391	18,990	29,005	1,534	2,347
1983	66,254	100,044	58,561	88,427	5,828	8,800
1984	153,571	227,285	11,498	170,172	15,938	23,588
1985	131,961	193,983	95,157	139,880	26,800	39,396
1986	166,851	236,928	138,498	196,667	27,311	38,782
1987	116,564	158,527	108,816	147,989	7,527	10,237
1988	163,189	215,409	139,902	184,671	19,940	26,320
1989	129,460	164,414	111,923	142,142	13,269	16,852
1990	66,865	78,900	59,747	70,501	5,554	6,554
1991	110,275	124,611	95,936	108,408	12,083	13,654
1992	132,899	143,531	106,260	114,760	22,629	24,439
1993	94,707	102,283	64,890	70,081	27,113	29,282
1994	348,401	369,305	271,170	287,440	68,993	73,132
1995	400,140	416,145	310,815	323,248	78,880	82,035
1996	**620,474**	**620,474**	**526,563**	**526,563**	**85,984**	**85,984**
Average	**181,562**	**212,349**	**141,248**	**173,330**	**27,959**	**32,093**

Figure 12. American Samoa average adjusted price for tunas and other PPMUS

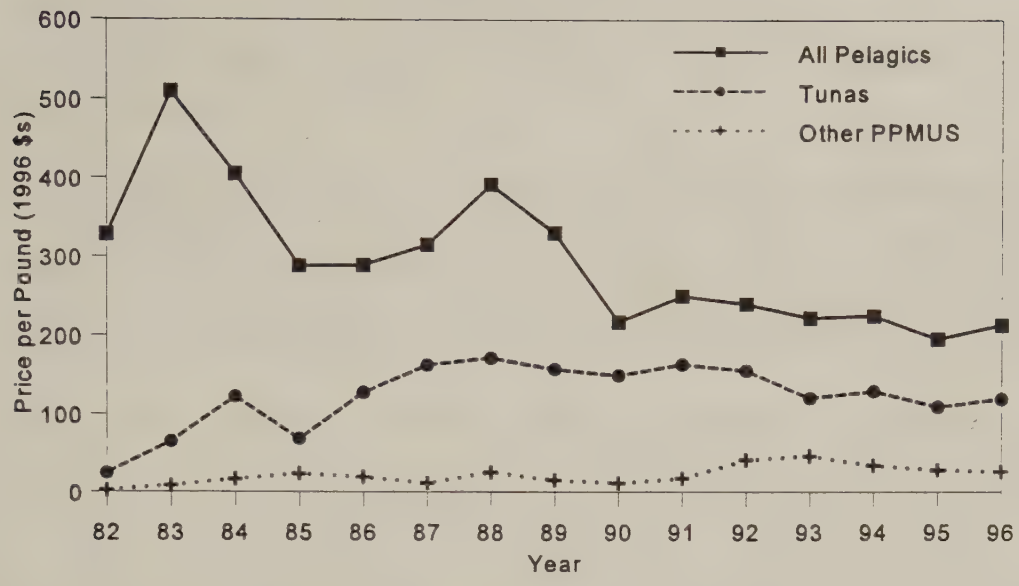


Interpretation: Prices for tuna increased slightly in 1996. Prices in general for pelagic species remain low likely because of competition from frozen fish purchased from foreign longline vessels moored in Pago Harbor and from fishes imported from neighboring islands.

Calculation: The average price per pound for each year is calculated by dividing the estimated revenue by the estimated weight sold. The adjustment for inflation is made by multiplying the annual average price for a given year by the 1996 consumer price index (CPI) for American Samoa, and dividing by the CPI for the given year.

	Average Price ($/lb)			
	Tunas		Other PPMUS	
Year	Unadjust.	Adjusted	Unadjust.	Adjusted
1982	0.86	1.32	1.01	1.55
1983	0.69	1.04	1.31	1.98
1984	0.59	0.87	1.18	1.75
1985	0.95	1.40	1.53	2.25
1986	0.81	1.16	1.37	1.94
1987	0.83	1.13	1.19	1.62
1988	0.83	1.09	1.40	1.85
1989	0.98	1.25	1.23	1.57
1990	1.15	1.35	1.13	1.34
1991	1.51	1.70	1.49	1.69
1992	1.15	1.24	1.92	2.08
1993	1.52	1.65	2.09	2.26
1994	1.36	1.44	1.62	1.72
1995	1.06	1.10	1.41	1.47
1996	**1.30**	**1.30**	**1.35**	**1.35**
Average	**1.04**	**1.27**	**1.42**	**1.76**

Figure 13. American Samoa average inflation-adjusted revenue per trip landing PPMUS for non-longline vessels

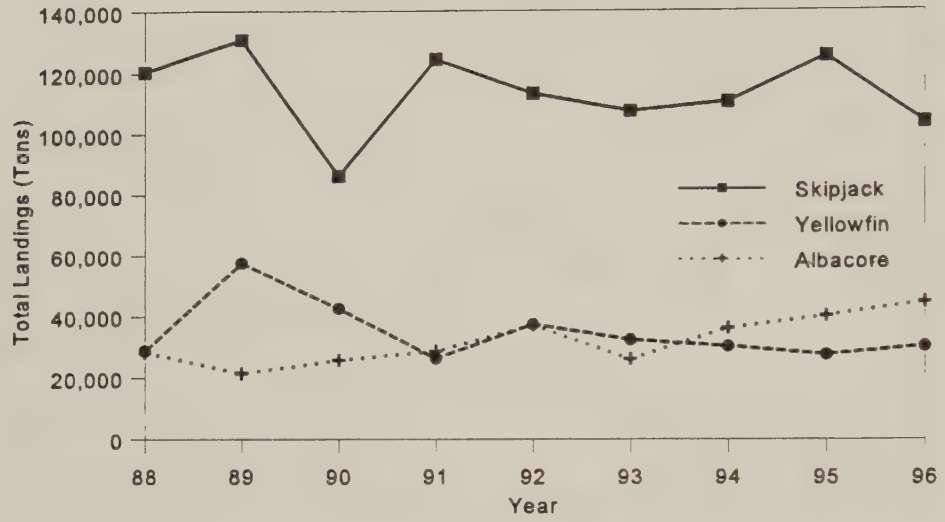


Interpretation: Revenue per trip increased slightly in 1996 but remains relatively low. In spite of slight increases in CPUE, low ex-vessel prices resulted in an overall decline in per trip revenue.

Calculation: For commercial trips where pelagic species were landed, the average revenue per trip was calculated for each category. Revenue was adjusted for inflation by multiplying it by the quotient of the 1996 CPI divided by the respective years' CPI.

	Revenue per trip ($)					
	All Pelagics		Tunas		Other PPMUS	
Year	Unadjust.	Adjusted	Unadjust.	Adjusted	Unadjust.	Adjusted
1982	214	328	16	24	1	2
1983	338	510	43	65	5	8
1984	274	405	82	122	11	16
1985	196	288	47	68	16	23
1986	203	289	90	127	14	19
1987	232	315	119	162	8	11
1988	297	392	130	171	19	25
1989	260	330	124	157	12	15
1990	184	217	126	149	9	11
1991	221	250	145	163	15	17
1992	223	240	144	155	38	41
1993	206	222	111	120	42	46
1994	212	225	122	129	32	34
1995	187	195	105	109	27	28
1996	**213**	**213**	**119**	**119**	**26**	**26**
Average	**231**	**295**	**102**	**123**	**18**	**21**

Figure 14. Total cannery landings for skipjack, yellowfin and albacore tuna



Interpretation: The quantity of fish landed at American Samoa's canneries exceeds local landings by a factor of a thousand. Though some locally caught pelagics, especially albacore, are sold to the canneries, the vast majority of the fish landed have been taken in distant water fisheries. Cannery landings have remained essentially stable for the last five years, though albacore landings have increased across time.

Calculation: Cannery landings are from monthly landings summaries supplied by the canneries.

	Short Tons landed		
Year	**Skipjack**	**Yellowfin**	**Albacore**
1988	120,500	28,800	28,200
1989	130,800	57,500	21,400
1990	86,300	42,600	25,700
1991	124,400	26,200	28,500
1992	113,200	37,200	36,900
1993	107,400	32,200	26,000
1994	110,500	30,100	36,000
1995	125,300	27,300	40,000
1996	**103,600**	**30,000**	**44,500**
Average	**113,556**	**34,656**	**31,911**

Appendix 2

Territory of Guam

Introduction and Summary

Pelagic fishing vessels based on Guam fall into two broad categories: 1) distant -water purse seiners and longliners that fish primarily outside the EEZ and transship through Guam and 2) small primarily recreational trolling boats that are either towed to launch sites or berthed in the marinas and fish only local waters, either within the EEZ or occasionally in the adjacent EEZ of the Northern Mariana Islands. This report covers primarily the local small-boat pelagic fishery.

During the past 17 years, the estimated number of vessels participating in the fishery has steadily increased from 119 in 1980, to approximately 482 in 1996. Most vessels are less than 10 m (33 feet) in length and are typically owner-operated by persons who earn a living outside of fishing. However, almost everyone sells a portion of their catch at one time or another, and it is impossible to make a distinction between recreational, subsistence, or commercial fishers. A small segment of the troll fleet, approximately 7%, consists of marina-berthed charter vessels that are operated primarily by full-time captains and crews.

Estimated annual landings have varied widely, ranging between 175 and 433 tons. Landings in 1996 consisted almost entirely of five major species: mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and pacific blue marlin (*Makaira mazara*). Minor components include rainbow runner (*Elagatis bipinnulatus*), great barracuda (*Sphyraena barracuda*), kawakawa (*Euthynnus affinis*), dogtooth tuna (*Gymnosarda unicolor*), and shortbill spearfish (*Tetrapterus angustirostris*). Approximately a dozen additional species are landed incidentally each year.

There are wide year to year fluctuations in the catches of the five major pelagic species, with significant increases and decreases seen with wahoo, yellowfin tuna, and blue marlin. Landings of wahoo made the most significant increase, 81% compared to 1995, only exceeded by landings in 1985. Landings of yellowfin tuna also increased significantly, increasing 32% compared to 1995. Blue marlin landings decreased significantly during 1996, decreasing 40%. The estimated 60,500 pounds of blue marlin landed is the lowest since 1986.

Aggregate landings of non-tuna PPMUS and all pelagics fluctuate greatly, but appear to be increasing, while those of the tunas show no general trend. In the early 1980s the bulk of the catch consisted of tunas, but since 1985 it has consisted of non-tuna or "other" PPMUS, with mahimahi usually the most important species. Commercial landings of all pelagics also show a similar trend.

Effort in terms of total hours, total trips and trip length all decreased slightly. This may be a reflection of the charter boat segment and most non-charter trollers which generally makes half-day or shorter trips, rather than full-day fishing trips. Charter boats make up a significant

portion of effort. While making up only 7% of the troll fleet, they account for 35% of the trips and 30% of troll hours fished.

Commercial inflation-adjusted revenues for all pelagic species, tunas and other PMUS decreased approximately 35% from 1995. Inflation adjusted revenue per trip for all pelagic species, tunas and other PMUS and also decreased between 1995 and 1996. The price of tuna and other PPMUS still show a general decline although the price of non-tuna PPMUS increased. While this does not promote a healthy atmosphere for commercial fisheries, charter boats and the vast majority of non-charter boats do not earn a living selling their catch and are not affected by these decreases.

Annual trolling catch rates have varied widely for all species. However, significant differences were observed between charter boats and non-charter boats with blue marlin, skipjack tuna, and yellowfin tuna. These differences may be due to targeting certain species, availability of stocks, and length of fishing trip.

Inflation-adjusted prices have steadily declined since 1980. The difficulty of obtaining a consistent supply of fresh fish from local fishermen has forced many marketers to turn to other sources, at least part of the time. Some hotels import higher-priced tuna from Japan to meet their demand for sashimi. There is also a widespread belief among local fishermen that the flooding of local markets with inexpensive foreign-caught fish in recent years has depressed their ex-vessel prices. The Department of Commerce approximates that 5% of "rejected" fish from longliners enters the local economy, which must be value-added before being sold.

The Guam Department of Commerce provided transshipment data for 1996. No domestic or foreign longliners were issued licenses to fish within Guam's EEZ. However, the Guam Department of Commerce reported that in 1996, 421 foreign longliners made 1,253 port calls and transshipped 9,460 tons of fish through Guam. This included 6,653 tons of yellowfin tuna (70% of the total catch), 2,014 tons of bigeye tuna (21%), 417 tons of blue marlin, and 375 tons of albacore tuna, black marlin, striped marlin, swordfish, and others combined. All these fish were allegedly caught outside of Guam's EEZ. The extent of illegal longlining activity is unknown.

DAWR is currently developing a new expansion system with the assistance of NMFS. The program, which will automate the expansion process, should be completed in 1997.

Recommendations

1. The status and ongoing usefulness of the Guam consumer price index for time-series inflation-adjustment should be reviewed. The team has been concerned over the apparent continuing decline in pelagic prices on Guam. Although nominal (unadjusted) prices have risen, inflation-adjusted prices have continued to fall. A respected Guam economist suggested that it might be due to an outdated or incomplete market basket. This needs further investigation.

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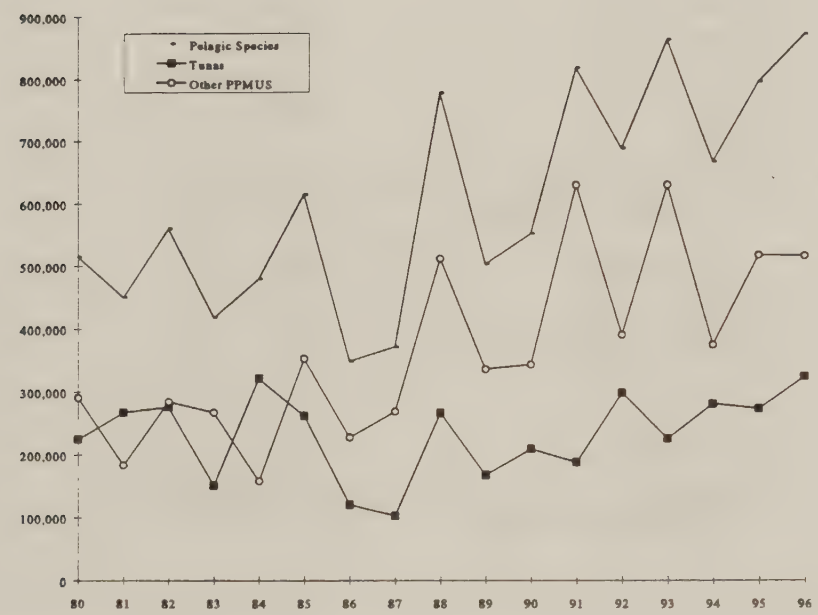
Table 1. Guam 1996 creel survey - pelagic species composition

Species	Pounds Landed
Sharks	3,348
Mahimahi	303,957
Wahoo	142,062
Blue Marlin	60,500
Striped Marlin	0
Sailfish	0
Spearfish	967
Dogtooth Tuna	2,063
Double-lined mackerel	28
Subtotal PPMUS	**512,925**
Skipjack Tuna	215,944
Yellowfin Tuna	102,670
Bigeye Tuna	0
Kawakawa	4,043
Tuna (misc.)	0
Subtotal Tunas	**322,657**
Rainbow Runner	23,902
Barracudas	5,500
Other	983
Subtotal Misc.	**30,385**
Total Pelagics	**865,967**

Table 2. Guam 1996 annual commercial average price of pelagic species

Species	Average Price ($/lb)
Sharks	0.55
Mahimahi	1.46
Wahoo	2.06
Marlin	1.00
Spearfish	1.25
Sailfish	1.01
Dogtooth Tuna	1.73
Average Other PPMUS	**1.52**
Skipjack Tuna	1.20
Yellowfin Tuna	2.10
Average Tuna	**1.62**
Troll fish	1.70
Rainbow Runner	1.59
Barracuda	1.52
Average All Pelagics	**1.55**

Figure 1. Guam annual estimated total landings: all pelagics, other PPMUS, and tunas.



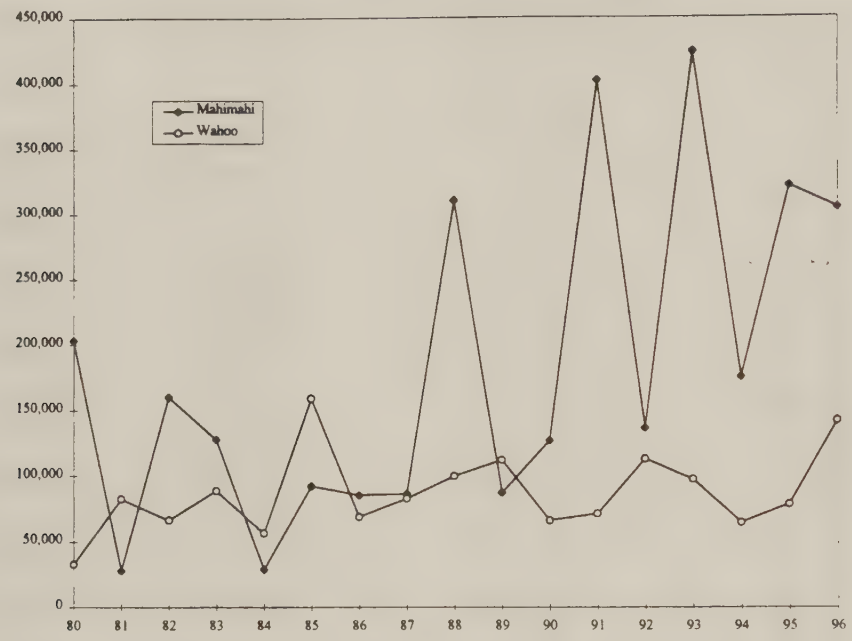
Interpretation: In the early 1980's the bulk of the pelagic catch tended to consist of tunas, but since 1985 it has consisted primarily of other (non-tuna) PPMUS. Reasons for this include a trend toward decreasing size and availability of yellowfin tuna from 1983 to 1989 and from 1992 to 1995, a lack of interest in skipjack tuna, increases in mahimahi landings since 1993, and an increasing interest in targeting blue marlin. Virtually all landings (>99%) are by the trolling method. Compared with 1995, 1996 landings for All Pelagics increased 9%, Other PPMUS increased <1%, and tuna landings increased 19%. The charter boat fishery, which mades up approximately 7% of the troll fleet, caught 23% of the total pelagic catch, 31% of the PPMUS catch, and 12% of the tuna landings.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program, expanded with the assistance of NMFS.

Calculation: An expansion was run for the calendar years survey data to produce catch and effort estimates for each fishing method surveyed. Percent species composition is calculated by weight for the sampled catch for each method to produce catch estimates for each species for the expanded period. The annual catch for all pelagic species and the PPMUS separately are summed across all methods to obtain the numbers plotted above except for 1992 which includes only the trolling method.

Year	Pounds Landed		
	All Pelagics	Other PPMUS	Tunas
1980	515,631	290,703	224,928
1981	450,813	183,549	267,264
1982	560,046	284,195	275,851
1983	418,222	267,117	151,106
1984	479,134	321,143	157,991
1985	614,520	352,649	261,872
1986	347,673	227,130	120,543
1987	370,586	268,068	102,519
1988	776,336	510,551	265,785
1989	501,880	334,857	167,024
1990	549,944	341,785	208,159
1991	814,786	627,398	187,388
1992	685,513	388,634	296,833
1993	858,944	626,907	224,656
1994	663,476	372,541	279,657
1995	791,176	514,391	271,505
1996	**865,967**	**512,925**	**322,657**
Average	**603,803**	**368,317**	**232,288**
Standard Deviation	**171,378**	**143,760**	**67,089**

Figure 2. Guam annual estimated total landings: mahimahi and wahoo



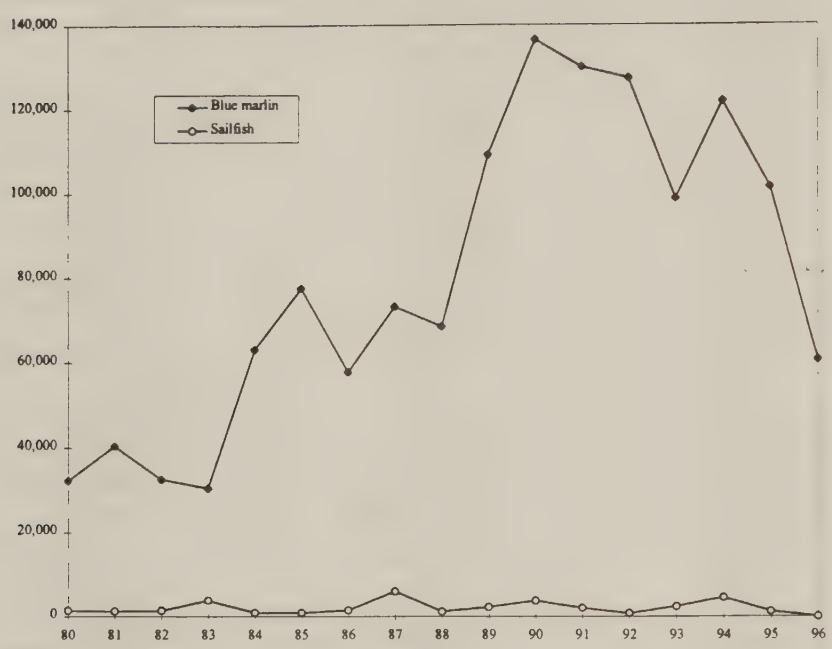
Interpretations: Landings of mahimahi exceeded those of all other species during nine of the past 17 years, making it the most important specie in Guam's small boat fishery. The landing of mahimahi increased significantly from 1994 to 1995, but decreased slightly (5%) in 1996. This is consistent with a long-term pattern of extreme fluctuations. Wahoo landings have fluctuated widely, but not to the extreme extent exhibited by mahimahi. Wahoo landings declined between 1992 to 1995, but increased 81% between 1995 and 1996. Virtually all landings are by the trolling method. Charter boat activity accounted for 26% of the mahimahi landings and 30% of the wahoo landings.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods for all years except 1992-93 as described in figure 1.

Year	Pounds Landed Mahimahi	Wahoo
1980	203,136	32,825
1981	27,954	82,635
1982	160,200	66,416
1983	128,130	89,010
1984	28,847	56,501
1985	92,407	159,300
1986	85,393	68,830
1987	86,362	82,892
1988	310,032	99,801
1989	87,158	111,977
1990	126,968	66,107
1991	402,107	71,001
1992	136,421	112,872
1993	423,988	97,448
1994	175,183	64,595
1995	321,014	78,530
1996	**303,957**	**142,062**
Average	**182,309**	**87,224**
Standard Deviation	**124,814**	**31,374**

Figure 3. Guam annual estimated total landings: blue marlin and sailfish



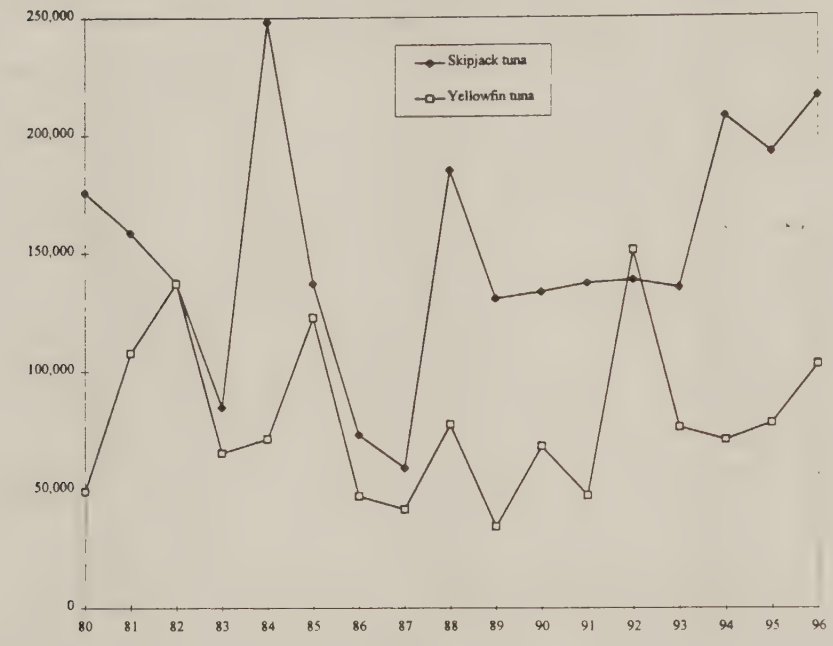
Interpretations: Landings of blue marlin decreased 40% between 1995 and 1996, the lowest in blue marlin landings since 1986. The historic rapid increase is landings observed from 1988 may have been due to increase targeting of this specie by during the marlin season by charter boats. Approximately 63% of the 1996 blue marlin landings were by charter boats. Sailfish were not encountered during the offshore creel surveys, although they were reported to have been landed. All landings of blue marlin are by the trolling method.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods for all years except 1992-93 as described in figure 1.

Year	Pounds Landed Blue Marlin	Sailfish
1980	32,192	1,411
1981	40,389	1,272
1982	32,465	1,425
1983	30,359	3,820
1984	63,057	952
1985	77,565	915
1986	57,682	1,474
1987	73,169	5,913
1988	68,511	1,145
1989	109,241	2,191
1990	136,541	3,730
1991	129,992	2,000
1992	127,356	745
1993	98,698	2,379
1994	121,844	4,482
1995	101,359	1,242
1996	**60,500**	**0**
Average	**80,095**	**2,068**
Standard Deviation	**36,514**	**1,556**

Figure 4. Guam annual estimated total landings: skipjack and yellowfin tunas



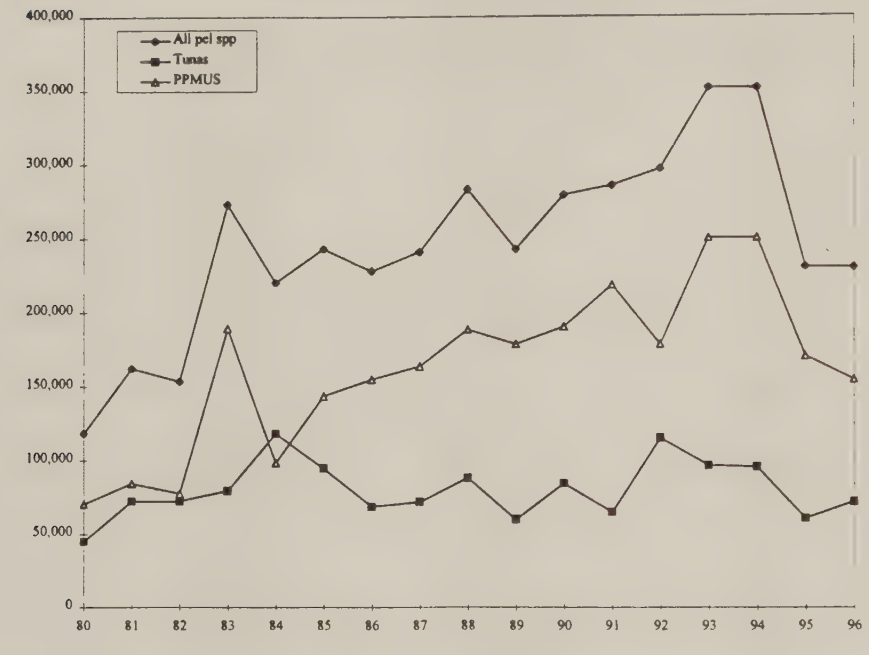
Interpretations: Landings of skipjack tuna exceeded those of all other species in five of the last 17 years, and were exceeded by mahimahi in all but one of the remaining years. This years catch was exceeded only by landings in 1984. With the exception of 1992, landings of skipjack tuna have always exceeded those of yellowfin tuna, often by a 2:1 or better margin. Given the relative unmarketablility of skipjack tuna in the local market and the desirability of yellowfin tuna, the availability of skipjack tuna probably exceeds that of yellowfin tuna by a wider margin. Landings of skipjack tuna increased 12% while landings of yellowfin increased 32%, with charter boat activity accounting for 15% of the skipjack tuna and 6% of the yellowfin tuna landings. Virtually all landings are by the trolling method.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods for all years except 1992-93 as described in figure 1.

Year	Pounds Landed Skipjack tuna	Yellowfin tuna
1980	175,542	49,386
1981	158,493	107,828
1982	137,735	137,202
1983	85,008	65,598
1984	248,243	71,502
1985	137,097	122,707
1986	73,199	47,290
1987	59,228	41,754
1988	184,838	77,434
1989	130,682	34,404
1990	133,460	68,076
1991	137,136	47,398
1992	138,547	151,025
1993	135,163	76,285
1994	207,713	70,902
1995	192,218	78,021
1996	**215,944**	**102,670**
Average	**150,014**	**79,381**
Standard Deviation	**50,556**	**34,062**

Figure 5. Guam annual estimated commercial landings: all pelagics, tunas, and other PPMUS



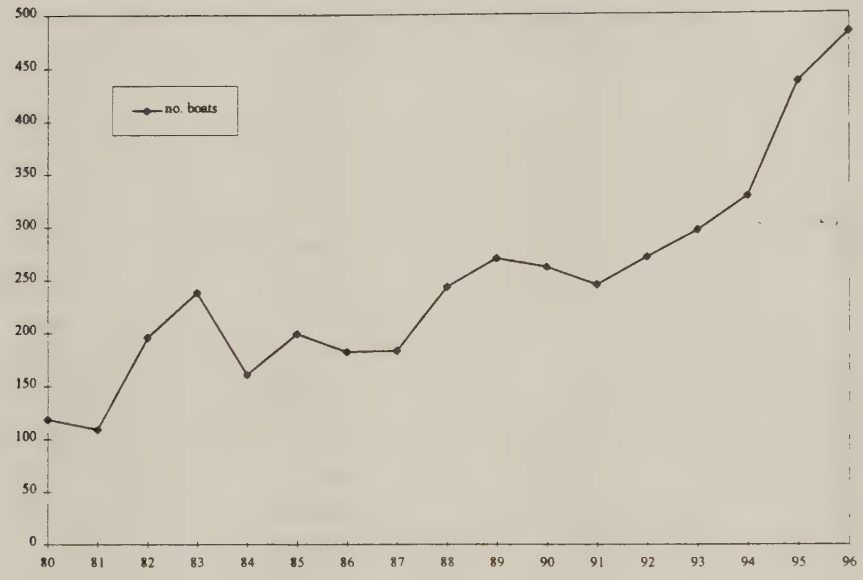
Interpretations: Commercial pelagic fishery landings appear to have increased steadily for the last 15 years. The drop in 1995 may have been due to a major fish vendor going out of business and from fishermen marketing their fish elsewhere than the Fishermen ' s Coop, a major receipt book vendor. In 1996, commercial landings of all pelagic species decreased slightly, while an increase (18%) was observed with tunas, and a slight decrease (9%) observed with other PPMUS. This is consistent with the offshore landings calculated from creel surveys. In 1996, the number of fish vendors has increased and are in the process of being brought into the commercial receipt book program. The commercial receipt book program is continually identifying new commercial fish vendors to obtain a more accurate picture of commercial fish landings in this growing market.

Source: The WPacFIN-sponsored commercial landings system.

Calculation: The total estimated commercial landings for each year were calculated by summing the weight fields in the commercial landings data base from the principle fish wholesalers on Guam, and then multiplying by an estimated percent coverage expansion factor. The annual expansion factor was subjectively created based on as much information as possible depending on the year, including: an analysis of the "disposition of catch" data available from the DAWR offshore creel survey; an evaluation of the fishermen in the fishery and their entry/exit patterns; general "dock side" knowledge of the fishery and the status of the marketing conditions and structure; the overall number of records in the data base; and a certain measure of best guesses.

Year	Pounds Landed		
	All Pelagic Species	Tunas	Other PPMUS
1980	118,275	45,043	70,319
1981	162,186	72,229	84,371
1982	153,577	72,347	77,602
1983	273,120	79,313	189,241
1984	220,074	118,167	98,412
1985	243,060	94,691	143,509
1986	227,928	68,510	154,749
1987	240,790	71,711	163,449
1988	283,264	87,962	188,498
1989	242,554	59,825	178,424
1990	279,121	84,176	190,201
1991	285,696	64,694	218,588
1992	296,809	114,765	178,307
1993	351,201	96,289	250,211
1994	351,187	95,321	250,348
1995	230,585	60,403	170,182
1996	**229,908**	**71,528**	**154,184**
Average	**246,431**	**79,822**	**162,388**
Standard Deviation	**62,715**	**19,527**	**54,592**

Figure 6. Guam estimated number of trolling boats



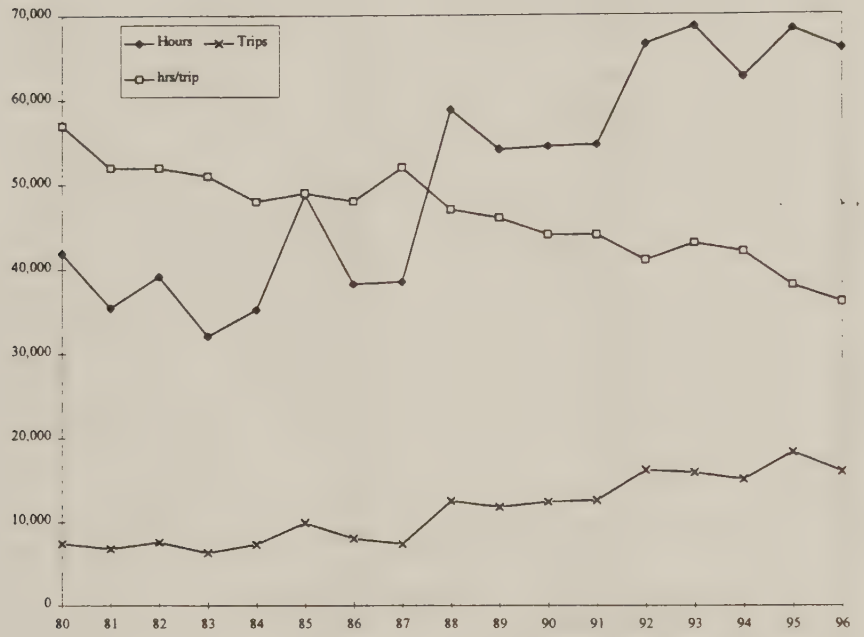
Interpretations: The number of trolling boats on Guam has been steadily increasing, especially since the addition of two marinas in the offshore sampling program. There appears to be a general increase in the number of small boats participating in Guam's fisheries since 1980, while the number of charter vessels has remained fairly constant in the past year There are approximately 30 charter boats, making up 7% of the troll fleet. The number of boats participating in the fishery increased 11% from 1995.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Since only a fraction of the days of the year are actually sampled, it is not possible to know the exact number of boats participating in the fishery. The trolling boat log of 1996 was converted and processed through a boat estimator model by NMFS 1000 times, then eliminating the upper and lower 25 estimates. This "refinement" lowered the boat estimates less than 1%, but reduced standard deviation by 20%.

Year	Number of Boats
1980	119
1981	109
1982	196
1983	238
1984	161
1985	199
1986	182
1987	183
1988	243
1989	270
1990	262
1991	245
1992	271
1993	296
1994	328
1995	436
1996	**482**
Average	**248**
Standard Deviation	**99**

Figure 7. Guam annual estimated pelagic species trips, hours, and hours per trip for trolling



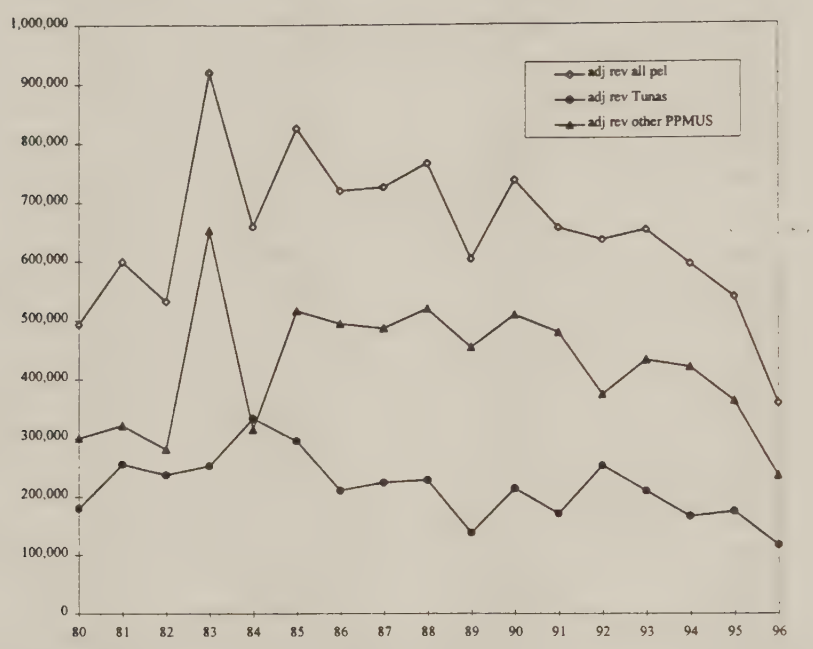
Interpretations: In 1996, the number of hours, trips, and hours per trip decreased slightly, 3%, 13%, and 5% respectively. Mean trip length continues to decrease since trolling for charter boats and most recreational boaters tend to be half day rather than full day activities . Several charter boats have trips only two hours in length. In 1996, charter boats comprise a very significant portion of the trolling effort. While comprising only 7% of the trolling fleet, charter boats accounted for 30% of the total hours fished and 35% of all trolling trips .

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. These plots are of the estimated boat hours spent fishing and number of trips for the trolling method as taken directly from creel survey expansion system printouts.

Year	Hours	Trips	Hours per Trip
1980	41,870	7,394	5.7
1981	35,430	6,763	5.2
1982	39,146	7,566	5.2
1983	32,085	6,287	5.1
1984	35,196	7,276	4.8
1985	48,823	9,900	4.9
1986	38,201	7,992	4.8
1987	38,475	7,342	5.2
1988	58,874	12,454	4.7
1989	54,119	11,725	4.6
1990	54,486	12,340	4.4
1991	54,686	12,523	4.4
1992	66,535	16,076	4.1
1993	68,609	15,810	4.3
1994	62,616	15,003	4.2
1995	68,285	18,214	3.8
1996	**65,952**	**15,936**	**3.6**
Average	**50,788**	**11,212**	**4.7**
Standard Deviation	**13,002**	**3,951**	**0.6**

Figure 8. Guam annual estimated commercial inflation-adjusted total revenues: all pelagics, tunas, and other PPMUS



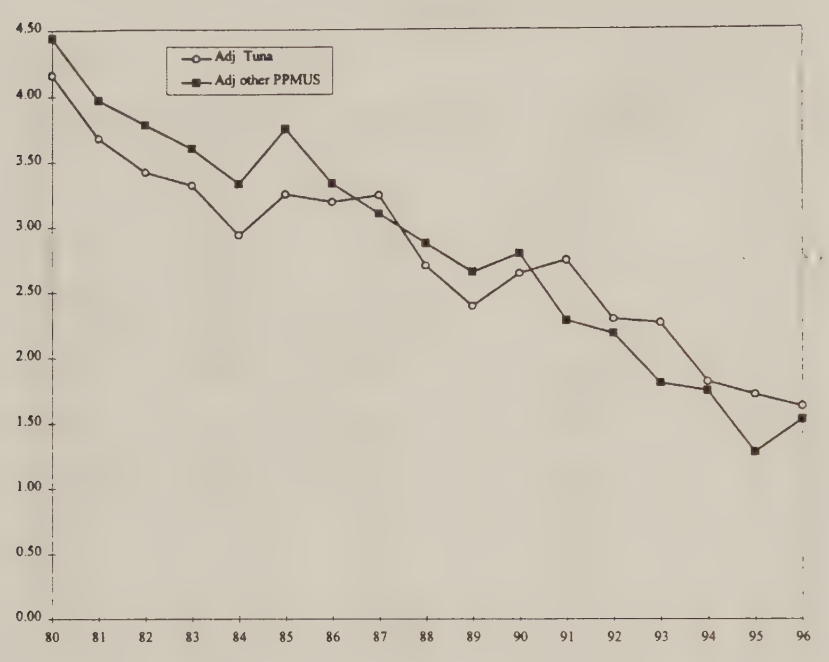
Interpretations: Revenues for all pelagic species and other PPMUS remained fairly steady from 1985 to 1990 followed by a drop since then. Revenues for tunas increased slightly from 1989 to 1992, but have fallen since then. Adjusted revenues for all pelagics, runas, and other PPMUS have decreased 34%, 34%, and 36% respectively. This indicates an overall declining economic condition of the fishery when one considers that commercial landings have increased slightly (figure 5). This occurs since the charter boat industry does not depend primarily on selling their catch for their success, and most recreational boats earn a living outside of fishing.

Source: The WPACFIN-sponsored commercial landings system.

Calculation: The total estimated revenue for each year was calculated by summing the revenue fields in the commercial landings data base from the principle fish wholesalers on Guam, and then multiplying by the same percent coverage expansion factor as were the landings in figure 5. Inflation-adjusted total revenue per trip is derived from the Guam annual Consumer Price Index (CPI).

	Revenues ($)					
	All Pelagics		Tunas		Other PPMUS	
Year	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	149,160	514,452	54,353	187,462	90,623	312,558
1981	218,384	625,453	92,914	266,107	117,052	335,238
1982	203,847	555,280	90,719	247,118	107,573	293,029
1983	364,527	959,435	100,029	263,277	258,501	680,374
1984	283,724	686,896	143,598	347,651	135,498	328,041
1985	369,651	861,656	131,953	307,583	230,855	538,124
1986	330,302	749,455	96,395	218,720	226,935	514,915
1987	347,753	755,668	107,055	232,630	233,116	506,561
1988	386,468	798,057	114,981	237,436	261,901	540,826
1989	337,586	628,585	76,865	143,123	253,932	472,821
1990	471,241	768,124	136,321	222,203	325,372	530,356
1991	462,191	683,580	119,640	176,948	337,328	498,908
1992	492,707	661,706	195,547	262,619	289,129	388,300
1993	547,835	678,768	175,360	217,271	362,728	449,420
1994	593,838	619,373	165,296	172,403	418,612	436,612
1995	537,889	541,654	173,629	174,845	361,363	363,982
1996	**357,244**	**357,244**	**116,130**	**116,130**	**234,486**	**234,486**
Average		**673,258**	**223,149**			**436,733**
Std Deviation	**141,095**		**58,492**			**115,190**

Figure 9. Guam average price of tunas and other PPMUS



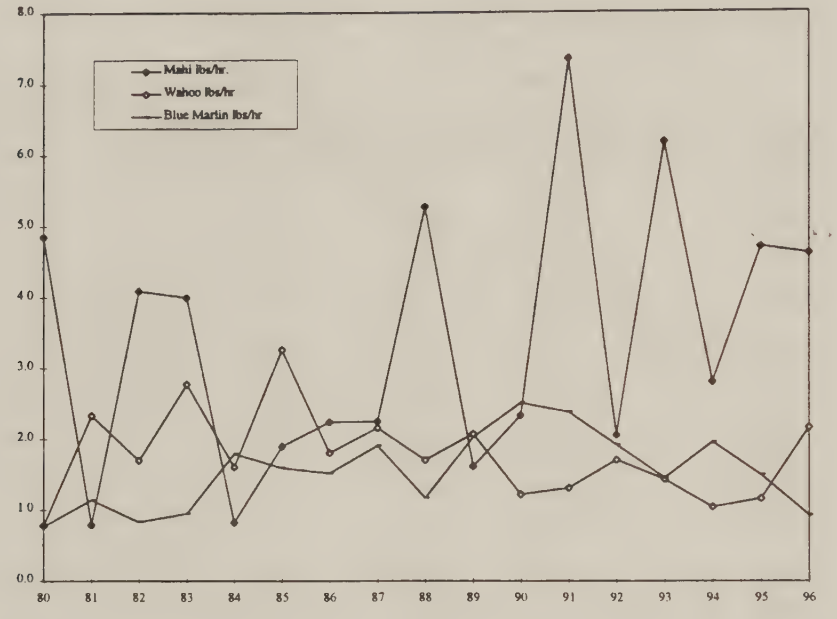
Interpretations: The inflation-adjusted price of tunas and other PPMUS shows a general decline during the past 15 years. However, the price of non-tuna PPMUS increased 20% from 1995. The overall decline does not promote a healthy atmosphere for the commercial fishery, but does not necessarily adversely affect the charter boat industry since their success does not directly depend on the price of fish. Therefore, while the price of pelagics has been consistently dropping, fishing effort may increase.

Source: The WPACFIN-sponsored commercial landings system.

Calculation: The average price of the Tunas and other PPMUS groups are calculated by dividing the total revenue for each by the sold weight. The inflation adjustment is made by using the Consumer Price Index (CPI) for Guam and establishing the current year figure as the base from which to calculate expansion factors for all previous years (e.g., divide the current year CPI by the CPI of any given year), and then multiplying that factor by the unadjusted average price for the given year.

	Price ($/lb.)			
	Tunas		Other PPMUS	
Year	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	1.21	4.16	1.29	4.44
1981	1.29	3.68	1.39	3.97
1982	1.25	3.42	1.39	3.78
1983	1.26	3.32	1.37	3.6
1984	1.22	2.94	1.38	3.33
1985	1.39	3.25	1.61	3.75
1986	1.41	3.19	1.47	3.33
1987	1.49	3.24	1.43	3.1
1988	1.31	2.7	1.39	2.87
1989	1.28	2.39	1.42	2.65
1990	1.62	2.64	1.71	2.79
1991	1.85	2.74	1.54	2.28
1992	1.7	2.29	1.62	2.18
1993	1.82	2.26	1.45	1.8
1994	1.73	1.81	1.67	1.74
1995	1.7	1.71	1.27	1.27
1996	**1.62**	**1.62**	**1.52**	**1.52**
Average		2.79		2.85
Std Deviation		0.67		0.9

Figure 10. Guam trolling catch rates: mahimahi, wahoo, and blue marlin



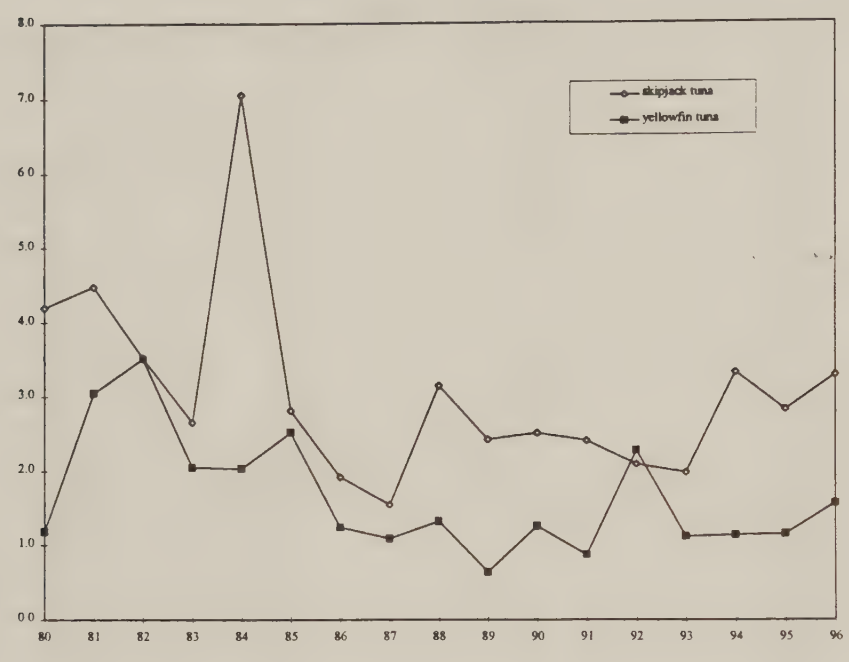
Interpretations: The wide fluctuations in CPUE are probably due to the high variability in the year to year abundance and availability of the stocks. However, since it is not possible to allocate species-specific effort, effort used to target other species can also result in artificially high or low catch rates for a given species. No general trend in CPUE is apparent for wahoo, blue marlin, or mahimahi. The overall catch rate for mahimahi decreased slightly, 7%, the catch rate for blue marlin decreased 40%, while catch rate for wahoo increased 82% in 1996. Catch rates for mahimahi and blue marlin differed between charter boats and non-charter boats, 4.0 and 4.9 respectively for mahimahi, and 2.0 and 0.5 respectively for blue marlin. Blue marlin CPUE for chater boats is expected to be higher since they target blue marlin. CPUE values for wahoo were similar for charter and non-charter boats.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of mahimahi, wahoo, and blue marlin, each divided by the total number of hours spent fishing (gear in use).

Pounds Landed			
Year	Mahimahi	Wahoo	Blue Marlin
1980	4.9	0.8	0.8
1981	0.8	2.3	1.1
1982	4.1	1.7	0.8
1983	4.0	2.8	0.9
1984	0.8	1.6	1.8
1985	1.9	3.3	1.6
1986	2.2	1.8	1.5
1987	2.2	2.2	1.9
1988	5.3	1.7	1.2
1989	1.6	2.1	2.0
1990	2.3	1.2	2.5
1991	7.3	1.3	2.4
1992	2.0	1.7	1.9
1993	6.2	1.4	1.4
1994	2.8	1.0	1.9
1995	4.7	1.2	1.5
1996	**4.6**	**2.2**	**0.9**
Average	**3.4**	**1.8**	**1.5**
Standard Deviation	**1.9**	**0.6**	**0.6**

Figure 11. Guam trolling catch rates: skipjack and yellowfin tunas



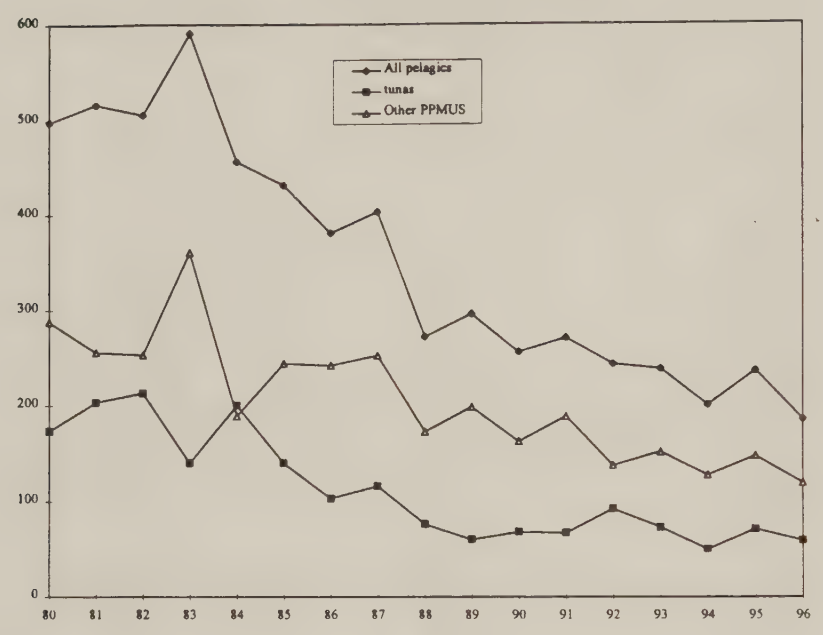
Interpretations: The wide fluctuations in CPUE for tunas are probably due to the high variability in the year to year abundance and availability of the stocks. However, since it is not possible to allocate species-specific effort, effort used to target other species can also result in artificially high or low catch rates for a given specie. Catch rate for skipjack tuna decreased 18% while catch rate for yellowfin tuna increased 45% compared with 1995. Non-charter boats had a significantly higher catch rate compared with charter boats, 4.0 and 1.6 for skipjack tuna respectively, and 2.1 and 0.3 for yellowfin tuna respectively.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. This plot and table were calculated in the same way as figure 10.

Pounds Per Hour Fished		
Year	Skipjack Tuna	Yellowfin Tuna
1980	4.2	1.2
1981	4.5	3.0
1982	3.5	3.5
1983	2.6	2.0
1984	7.1	2.0
1985	2.8	2.5
1986	1.9	1.2
1987	1.5	1.1
1988	3.1	1.3
1989	2.4	0.6
1990	2.5	1.2
1991	2.4	0.9
1992	2.1	2.3
1993	2.0	1.1
1994	3.3	1.1
1995	2.8	1.1
1996	**3.3**	**1.6**
Average	**3.1**	**1.3**
Standard Deviation	**1.6**	**0.8**

Figure 12: Guam inflation-adjusted revenues per trolling trip landing tunas or other PPMUS species



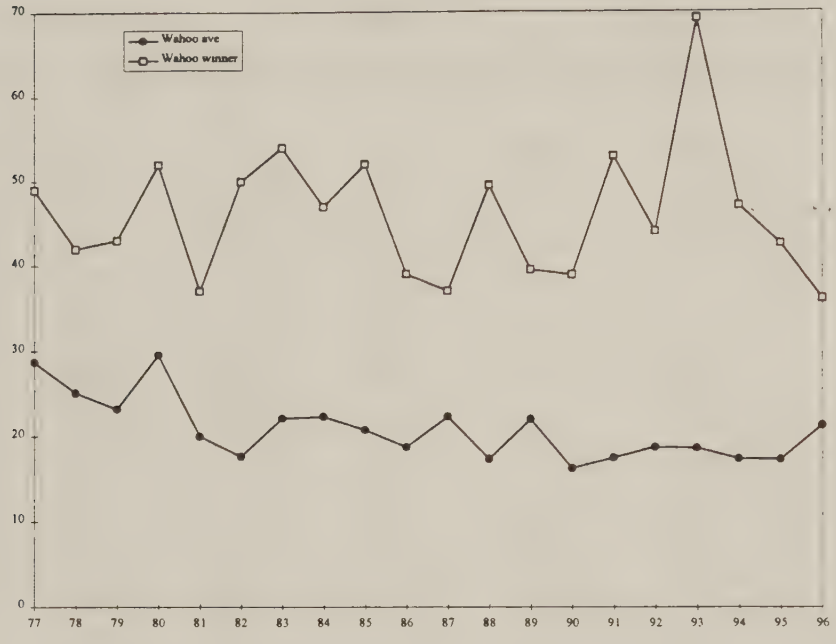
Interpretation: Adjusted revenue per trip for all pelagics, tunas and other PPMUS have experienced a general decline during the past 14 years. This cannot be attributed to the trend towards decreasing trip length since the decrease in revenues is considerably greater and since the charter fleet, which tends to take shorter trips, generally combine daily catches from 2-3 trips into a single trip receipt. One must be careful in interpreting the data for the Guam fishery because they were subject to biases created by marketing problems and the market structure upon which the data collecting system is based. For example, 1988, 1991, and 1993 were record high years for abundance and landings of mahimahi. One might expect the per-trip landings to be high for a year which had record landings. However, because of the glut on the market during the mahimahi season and because of other marketing problems, the per trip revenue was unusually low. Also, although revenue per trip has been declining, trolling effort will not necessarily decrease since charter boats, which account for a significant proportion of effort, and a vast majority of non-charter boats do not rely on selling their fish for a living. Effort still occurs regardless of revenue. Adjusted revenues for all pelagics, tunas, and other PPMUS decreased 22%, 17%, and 19% respectively.

Source: The WPacFIN-sponsored commercial landings system.

Calculation: The average revenue per trip was calculated by summing the revenue of all species sold then dividing by the number of trips, and summing the revenue of tunas and other PPMUS sold, and then dividing each by the number of trips, respectively, for any trip which landed PPMUS. Adjusted revenue per trip was derived from the Guam Annual Consumer Price Index (CPI).

	Revenues per trip ($)					
	All Pelagics		Tunas		Other PPMUS	
Year	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	144	498	50	173	84	288
1981	181	517	71	203	89	256
1982	186	506	78	213	93	253
1983	224	591	53	140	137	361
1984	189	457	83	200	78	189
1985	185	432	60	140	105	244
1986	168	381	45	103	107	242
1987	185	403	53	116	116	252
1988	132	272	37	76	83	172
1989	159	296	32	60	107	198
1990	157	256	42	68	99	162
1991	183	271	45	67	127	188
1992	181	243	69	92	102	137
1993	192	238	59	73	122	151
1994	192	200	48	50	121	127
1995	234	236	70	71	146	147
1996	185	185	59	59	119	119
Average		**352**		**112**		**205**
Standard Deviation		**129**		**56**		**66**

Figure 13. Guam-Marianas International Fishing Derby (GMIFD) - average size and size of winningfish: wahoo



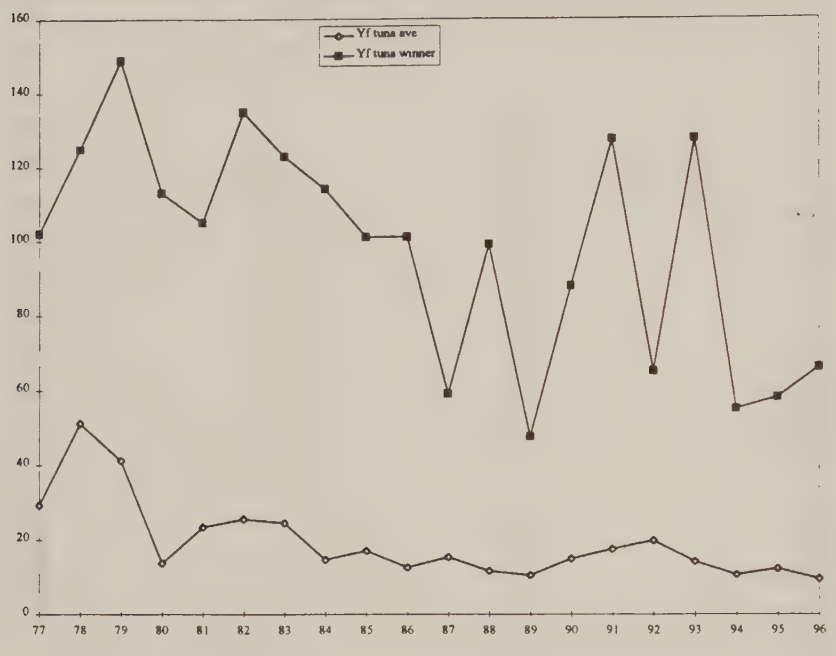
Interpretations: No general trend is apparent over the last 17 years.

Source: The Division of Aquatic and Wildlife Resources (DAWR) annual reports.

Calculation: The Guam International Fishing Derby (GIFD) is an annual three day event that occurs in July or August. Most of the wahoo caught are measured or weighed by derby officials. The figures here include some fishes whose weights are based on an average or estimate.

Year	Number Caught	Average Size (lb.)	Winning Fish(lb.)
1977	7	28.7	49
1978	9	25.1	42
1979	11	23.2	43
1980	12	29.5	52
1981	60	20.0	37
1982	33	17.6	50
1983	36	22.1	54
1984	46	22.3	47
1985	98	20.7	52
1986	16	18.7	39
1987	31	22.3	37
1988	72	17.3	49.5
1989	59	22.0	39.5
1990	34	16.2	38.9
1991	40	17.4	52.9
1992*	38	18.7	44.0
1993	19	18.6	69.2
1994	112	17.3	47.0
1995	81	17.2	42.5
1996	**222**	**21.2**	**36.0**
Average	**52**	**20.8**	**46.1**
Standard Deviation	**50**	**3.7**	**8.0**

Figure 14. Guam-Marianas International Fishing Derby (GMIFD) - average size and size of winning fish: yellowfin tuna



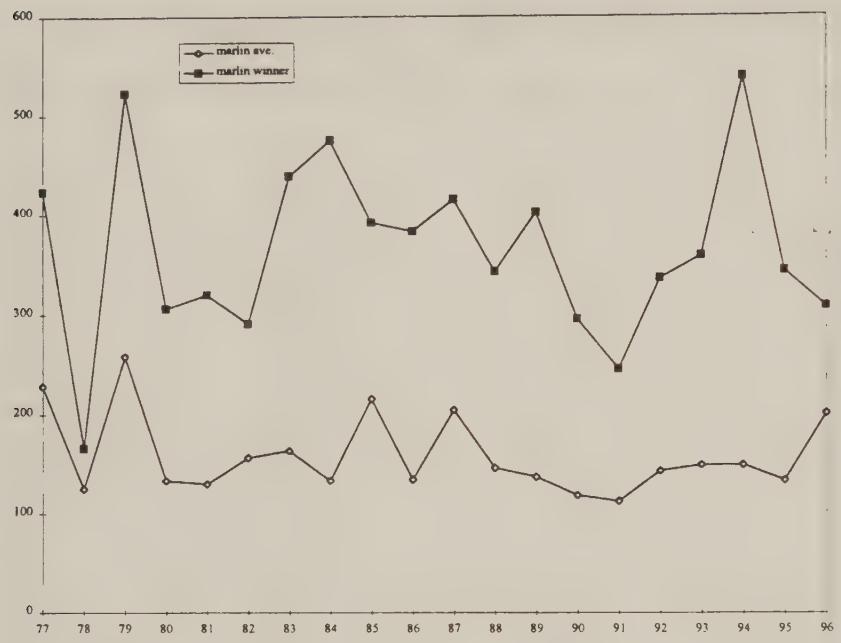
Interpretations: The size of the winning fish has fluctuated widely since 1986. This may indicate a lowered abundance of relatively large fishes since then. There seems to have been a slight recovery in the average size from 1989 to 1992 following a general decline during the previous 10 years. However the average size has declined since then, recovering only slightly this year.

Source: The Division of Aquatic and Wildlife Resources (DAWR) annual reports.

Calculation: The Guam International Fishing Derby (GIFD) is an annual three day event that occurs in July or August. Most of the yellowfin tuna caught are measured or weighed by derby officials. The figures here include some fishes whose weights are based on an average or estimate.

Year	Number Caught	Average Size (lb.)	Winning Fish (lb.)
1977	18	29.3	102
1978	11	51.2	125
1979	34	41.2	149
1980	50	13.7	113
1981	109	23.4	105
1982	205	25.6	135
1983	100	24.5	123
1984	59	14.6	114
1985	137	17.0	101
1986	71	12.6	101
1987	116	15.3	59
1988	161	11.6	99
1989	81	10.5	47.5
1990	81	14.9	88
1991	102	17.4	127.4
1992*	99	19.8	65.0
1993	103	14.1	127.6
1994	56	10.5	54.9
1995	174	12.2	58.0
1996	**318**	**9.5**	**66.0**
Average	**104**	**19.4**	**98.0**
Standard Deviation	**71**	**10.8**	**30.2**

Figure 15. Guam-Marianas International Fishing Derby (GMIFD) - average size and size of winning fish: blue marlin



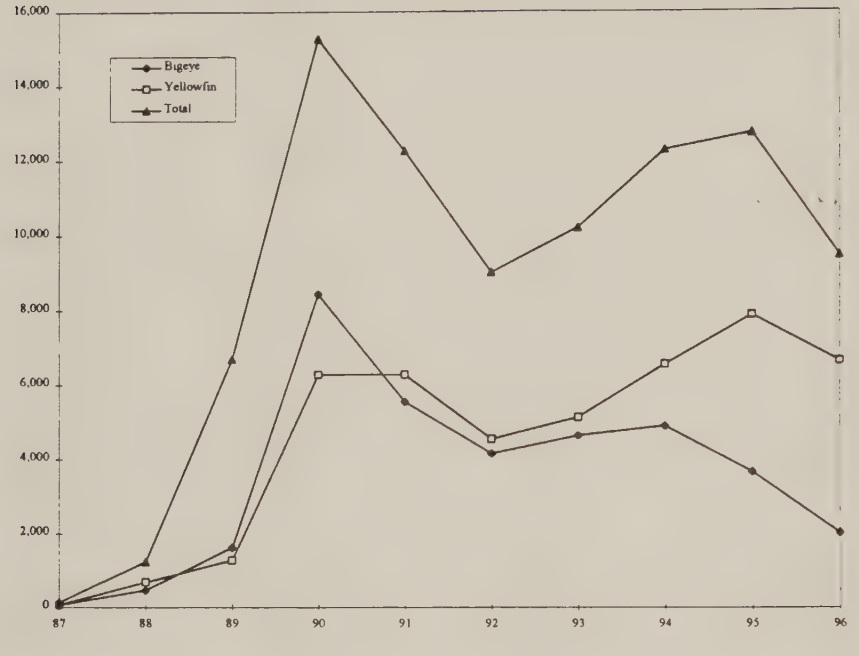
Interpretations: No general trend is apparent over the last 17 years. However there seems to have been a slight decline in the size of the winning fish and average size between 1987 and 1991 followed by a recovery during 1992 and 1993. The size of the winning fish this year was significantly smaller than last year.

Source: The Division of Aquatic and Wildlife Resources (DAWR) annual reports.

Calculation: The Guam International Fishing Derby (GIFD) is an annual three day event that occurs in July or August. Most of the billfish caught are measured or weighed by derby officials. The figures here may include a few fishes whose weights are based on an average or estimate.

Year	Number Caught	Average Size (lb.)	Winning Fish (lb.)
1977	9	228.4	423
1978	9	125.2	166
1979	6	258.4	523
1980	12	133.6	306
1981	34	130.1	320
1982	12	156.6	291
1983	13	163.6	439
1984	47	133.2	475
1985	17	215.2	392
1986	47	134.1	383
1987	43	203.9	415
1988	58	145.7	342.5
1989	86	136.7	402
1990	64	117.9	295
1991	61	112.0	245
1992*	42	142.5	336.0
1993	27	148.4	358.5
1994	45	148.6	538.5
1995	68	132.9	343.5
1996	**22**	**200.0**	**307.5**
Average	**36**	**158.3**	**365.1**
Standard Deviation	**24**	**40.5**	**90.6**

Figure 16. Annual Guam longline landings from primarily foreign longliners fishing primarily outside the Guam EEZ



Interpretation: Annual landings of the primarily foreign longline fishing fleet which transships its catch out of Guam have ranged up to 15,278 tons since the fishery began in the late 1980's. In 1996, the majority of longline vessels making port calls to Guam were by Taiwanese (79%) and Japanese vessels (14%). Overall landings for 1996 comprise of 21% bigeye tuna, 70% yellowfin tuna, 5% various marlin species, and 4% of all other species combined.

Of the total fish entering Guam through longliners, 27% were classified as "rejected" fish. According to the Department of Commerce, this fish is either kept on Guam for storage for later shipment to canneries, sold on Guam, given out, or destroyed. The Department of Commerce estimates that approximately 5% of the "rejected" fish enters the local fish market on Guam. Current regulations allow for this fish to enter the local market, but only as value-added or processed fish. The Department of Commerce is aware of the tuna leakage into the local market. However, the agency responsible for regulating that this "rejected" longline tuna entering the local market is value-added or processed tuna and for developing Standard Operating Procedures for this new market is the Department of Customs and Quarantine.

Source: The Guam Department of Commerce.

Calculation: Pre-1990 data was extracted directly from transshipment agents' files. Beginning in 1990, a mandatory data submission program was implemented.

Year	Total (tons)	Bigeye tuna (tons)	Yellowfin tuna (tons)
1987	144	60	72
1988	1,236	462	682
1989	6,691	1,615	1,274
1990	15,278	8,433	6,283
1991	12,264	5,549	6,279
1992	9,017	4,150	4,537
1993	10,207	4,630	5,126
1994	12,283	4,896	6,553
1995	12,733	3,658	7,872
1996	**9,460**	**2,014**	**6,653**
Average	**8,931**	**3,546**	**4,533**
Standard Deviation	**4,949**	**2,561**	**2,819**

Appendix 3

Hawaii

Highlights

Hawaii pelagic landings in 1996 were quite stable for most gear types. Total landings and ex vessel value were almost exactly the same in 1996 as in 1995.

The aku boat (pole-and-line skipjack tuna) fishery has begun to show some signs of recovery after a long hiatus, and the troll-handline fishery is relatively stable in terms of overall landings.

The longline component of the Hawaii pelagic fishery remains strong, although more fishing effort is now directed toward tunas rather than swordfish (with resultant changes in catch composition). The number of active longliners has also declined as a number of vessels left Hawaii for U.S. mainland fisheries (primarily the East coast) over the past several years.

Probably the most significant change over the past several years has been the shift of longline effort out of swordfish into tuna. The number of swordfish-directed trips has declined from 319 in 1993 to just 92 trips in 1996. Meanwhile tuna-directed trips have increased from 542 to 657 over the same period.

Swordfish CPUE (catch per unit effort) on swordfish-directed longline trips is returning to its pre-1994 levels (14.5 swordfish per 1,000 hooks in 1996).

Finally, albacore landings by longline, handline, and other gear types have increased dramatically in the past 5 years. Much of this is being "exported" to California and the east coast as a fresh-frozen product. Whether this will become a significant market sector probably depends on continuing availability and these new markets.

A number of fishery management issues continue to percolate in the Hawaii pelagic fishery. Shark finning by longline and other vessels is an issue, as well as the problem of protected species by-catch (marine turtles and sea birds) in the longline fishery. Considerable research effort is being directed toward the by-catch problem by National Marine Fisheries Service (NMFS). The interaction between some longline vessels and a number of offshore seamount handline vessels is another issue which is being faced by the Council.

Information & Sources

This report contains the most recently available information on Hawaii's commercial pelagic fishery. Data on the recreational fishery are not available since recreational fishers are not required to file landings reports (if they sell no fish during the year) and there is no comprehensive creel survey of Hawaii anglers. Commercial fisheries data are compiled from

two sources: The State of Hawaii's Division of Aquatic Resources (HDAR) commercial catch reports, and the U.S. National Marine Fisheries Service (NMFS) Honolulu Laboratory longline logbooks and marketing monitoring samples.

The module was prepared using preliminary 1996 NMFS and HDAR commercial fishery data for Hawaii. NMFS longline data for 1995 were updated and can be considered "final", and the 1996 longline data are essentially complete. HDAR commercial catch reports for 1996, which comprise the troll, handline, pole-and-line, and other gears data, are approximately 95% complete. These data were not extrapolated for this year's report. HDAR troll-handline-other gear data for 1995 was updated. "Final" NMFS and HDAR figures for 1996 will appear in the annual report for 1997.

Data for previous years (including a time-series back to 1948 but primarily data from 1987) were updated extensively in last year's report to correct previous figures and estimates and to use consistent time-series data for comparison purposes. Information in graphs included in this year's report were generally updated from 1992. In some cases there may be inconsistencies between alternative data sets. Where possible, these are being rectified. However in some cases where estimation procedures were employed (e.g., the 1979-1986 longline time-series), differences will reflect different methods of dealing with missing information.

Small differences between species tables and gear tables may also exist due to rounding and differences in defining relevant gear types and species groupings.

The module was prepared by Sam Pooley, NMFS. Information on HDAR Commercial Marine Licenses and troll-handline catch rates was provided by Walter Ikehara and Reginald Kokubun, HDAR. Information on longline catch and logbooks was provided by Russell Ito and Frederick Dowdell, NMFS.

Hawaii commercial marine license information

Every fisherman, including crew members on commercial fishing vessels, who sells any marine species is required by the State to have a Commercial Marine License (CML) and, unless specifically exempted[1], is required to submit a catch report monthly to HDAR.

A total of 3,664 fishermen were licensed in calendar year 1996, of which 2,726 were required to file monthly catch reports. As of April 1997, HDAR had received 28,679 monthly reports (84% of the 34,163 monthly reports expected based on the number of license holders and the number of months in 1996 in which they held their licenses).

HDAR asks fishermen to identify their primary fishing gear or method on the Commercial Marine License at time of licensing. This does not preclude fishermen from using other gears or methods, but it indicates what they consider to be their primary fishing method.

	Number of licenses	
Primary fishing method	**1995**	**1996**
Trolling	1,504	1,586
Longline	589	561
Ika shibi & palu ahi	151	186
Baitboat	53	42
Total pelagic	2,297	2,375
Total all methods	3,481	3,664

[1] Only one person per vessel or fishing trip is required to submit a catch report. This person is usually, but not always, the captain (who may or may not be the vessel owner). Crew members are generally not required to submit catch reports.

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Table 1. Hawaii domestic commercial landings, revenue and prices[2], 1995-96

Species	1995 Pounds Landed (x 1,000)	1995 Ex-vessel Revenue (x $1,000)	1995 Average Price ($/lb)	1996 Pounds Landed (x 1,000)	1996 Ex-vessel Revenue (x $1,000)	1996 Average Price ($/lb)
Swordfish	6,000	13,500	2.25	5,900	13,900	2.36
Blue marlin	2,000	1,500	0.75	1,900	1,500	0.79
Striped marlin	1,300	1,200	0.92	1,000	900	0.90
Other billfish	500	400	0.80	400	400	1.00
Mahimahi	1,100	1,900	1.73	700	1,400	2.00
Wahoo	700	1,300	1.86	500	1,100	2.20
Moonfish	600	600	1.00	700	800	1.14
Sharks[3]	3,500	800	0.23	4,500	1,100	0.24
Other pelagics	110	150	1.36	100	200	2.00
Non-Tuna PMUS	**15,810**	**21,350**	**1.35**	**15,700**	**21,300**	**1.36**
Albacore	3,200	3,100	0.97	3,000	3,000	1.00
Bigeye tuna	4,700	15,500	3.30	5,200	20,000	3.85
Bluefin tuna	60	1,000	16.67	100	700	7.00
Skipjack tuna	1,700	2,100	1.24	2,300	2,900	1.26
Yellowfin tuna	5,000	11,200	2.24	3,800	9,000	2.37
Other tunas			0.00	10	10	1.00
Non-Tuna PMUS	**14,660**	**32,900**	**2.24**	**14,410**	**35,610**	**2.47**
TOTAL	**30,470**	**54,250**	**1.78**	**30,110**	**56,910**	**1.89**

Data: Data are combined from NMFS longline estimates and HDAR commercial catch reports for other pelagic gears. (See subsequent tables for details.) Due to rounding, totals between tables may differ.

Data Source: Imported from P8796a.cal (4/15/97)

Interpretation: Hawaii pelagic landings were essentially the same as in 1995, although ex-vessel revenue rose with higher average prices (prices are discussed later in this module). The relationship between longline and other gears (troll, handline, and aku boat) also was essentially the same (see Table 2).

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[2] Average price is calculated for this table as (*Ex vessel revenue / Pounds Landed*), rather than *Pounds Sold*.

[3] Shark "landings" represent estimated whole weight, often of sharks whose fins were the only part actually landed.

Table 2. Hawaii commercial pelagic landings and revenue by gear, 1995-96

Gear	Pounds Landed (x 1,000)	Pounds Sold (x 1,000)	Ex-vessel Revenue (x $1,000)	Average Price ($/lb)
		1995		
Baitboat	1,300	1,300	1,600	1.23
Handline[4]	2,500	2,400	4,100	1.71
Longline	22,700	22,700	43,400	1.91
Trolling	3,100	2,600	4,700	1.81
Other[5]	900	700	600	0.86
TOTAL	**30,500**	**29,700**	**54,400**	**1.83**
		1996		
Baitboat	1,700	1,700	2,300	1.35
Handline	2,400	2,400	4,500	1.88
Longline	23,000	23,000	45,800	1.99
Trolling	2,800	2,400	4,400	1.83
Other	100	100	100	1.00
TOTAL	**30,000**	**29,600**	**57,100**	**1.93**

Data: Data are from HDAR commercial catch reports for the non-longline pelagic gears and NMFS estimates for longline. HDAR reports are categorized into Baitboat (pole-and-line targetting skipjack tuna); handline (*ika shibi, palu ahi*, and miscellaneous handline techniques) targetting tunas; trolling (targetting tunas, billfish, mahimahi, and ono); and various other pelagic gears. Due to rounding, totals between tables may differ. Time-series data is included later in the module.

Data Source: Imported from GAS9n.dbf (4/15/97), Ito (1996), and LL96a.cal (4/15/97) in P8796n.cal (4/15/97).

Interpretation: Baitboats (pole-and-line skipjack (*aku*)) continued their relatively low level of landings (compared to the period before the closure of the Honolulu tuna cannery in 1984) although there was a 50% increase in aku landings between 195 and 1996. Pelagic handline and trolling landings and revenue were quite stable. Aggregate handline prices improved in 1996.[6] Longline landings were stable, and revenue grew slightly. Longline aggregate price rose slightly. "Other" landings in 1995 were predominately distant-water albacore landings. (See also Figures for more information on landings by species.)

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[4] Pelagic handline only.

[5] Other includes unknown.

[6] Aggregate prices combine the effects of changing species composition as well as species-specific price changes.

Table 3a. Hawaii longline landings and revenue, 1995-96.

Species	1995 Landings (x 1,000 lb)	1995 Revenue (x $1,000)	1996 Landings (x 1,000 lb)	1996 Revenue (x $1,000)
Blue marlin	1,280	1,110	1,050	880
Striped marlin	1,200	1,080	920	820
Swordfish	6,010	13,460	5,860	13,840
Mahimahi	570	810	230	330
Moonfish	630	600	730	800
Ono (wahoo)	200	330	130	220
Sharks	3,490	830	4,470	1,050
Other	510	440	460	550
Non-Tuna PMUS Subtotal	**13,890**	**18,660**	**13,850**	**18,490**
Albacore	1,930	2,080	2,520	2,620
Bigeye	4,580	15,340	4,890	19,510
Bluefin	60	1,010	50	730
Skipjack	50	160	90	70
Yellowfin	2,150	6,110	1,610	4,350
Tuna PMUS Subtotal	**8,770**	**24,700**	**9,160**	**27,280**
TOTAL	**22,660**	**43,360**	**23,010**	**45,770**

Data: Data are from NMFS Honolulu Laboratory compilations based on Federal logbooks filed by domestic longliners operating out of Hawaii.

Landings are estimates compiled by multiplying NMFS logbook figures for number kept per species by average weight per species from NMFS market monitoring in Honolulu. Data for 1996 are from preliminary average weights.

Revenue is based on whole weight prices and use Hawaii Division of Aquatic Resources average price per pound (ex vessel). Swordfish and shark are adjusted to whole-weight estimates.

Data Source: Imported from LL96a.cal (2/17/97)

Interpretation: *Changes in aggregate species composition should be qualified by reference to changes in trip type (see following table).*

Overall longline landings and landings by species composition were quite stable from 1995-96 despite significant changes over the past 3-5 years in the Hawaii longline fishery. Mahimahi landings were down significantly, but mahimahi tends to be a secondary longline species as well as highly variable annually. Shark landings increased as shark finning continues to be a major source of income, particularly for particular sectors of the fishery (including crews). Albacore landings continued to increase. Aggregate CPUE was stable for most species. However CPUE figures are considered to be more reliable indicators of underlying fish stocks when targeting is taken into consideration *(trip type)*.More detailed information on longline catch and effort statistics will be included in the NMFS annual report on the fishery being compiled by Russell Ito, Honolulu Laboratory.

Table 3b. Hawaii longline catch per unit effort by trip type[7], 1995-96.

Species	1995				1996			
	All Trips	Swordfish Trips	Mixed Trips	Tuna Trips	All Trips	Swordfish Trips	Mixed Trips	Tuna Trips
Blue marlin	0.63	0.65	1.16	0.49	0.47	0.19	0.86	0.38
Striped marlin	1.60	0.69	1.43	1.78	1.12	0.51	1.04	1.19
Swordfish	2.66	12.92	6.58	0.22	2.70	14.47	7.68	0.17
Mahimahi	4.29	6.81	10.36	2.44	1.65	2.31	3.48	1.05
Moonfish	0.45	0.02	0.08	0.61	0.52	0.04	0.08	0.69
Ono (wahoo)	0.48	0.16	0.22	0.59	0.32	0.23	0.16	0.37
Sharks	7.19	27.70	12.80	2.86	7.13	26.07	15.54	2.94
Albacore	3.26	5.53	2.04	3.23	4.05	5.91	3.50	4.05
Bigeye tuna	4.29	2.36	4.68	4.47	4.50	1.46	4.33	4.82
Yellowfin tuna	1.68	1.13	3.01	1.43	1.24	0.72	1.70	1.15
Number of hooks set x 1,000	**14,155**	**1,465**	**2,504**	**10,186**	**14,141**	**913**	**3,032**	**10,196**
Number of lightsticks x 1000	**1,328**	**721**	**538**	**69**	**903**	**301**	**552**	**50**

Data: Data are from NMFS Honolulu Laboratory compilations based on Federal logbooks filed by domestic longliners operating out of Hawaii. ***CPUE*** is the number of fish caught per 1,000 longline hooks. *Trip Type* refers to the identification of the primary target species for a particular trip, either as indicated by the vessel captain to NMFS logbook collection staff or designated by NMFS in the absence of a captain's designation.

Data Source: Imported from LL96trip.cal (4/22/97)

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[7] Trip type refers to the primary species target for each trip. (See *Data* description below).

Interpretation: This table shows the substantial difference in interpretation that categorization of CPUE by trip type can make. Swordfish trips have twice the swordfish CPUE as Mixed trips, while swordfish is a small incidental catch in Tuna trips. The aggregate (All Trips) CPUE figures are not good indicators of catchability or abundance, although they do indicate the relative importance of particular species within the fishery as a whole.
Swordfish trip CPUE for swordfish increased substantially in 1996, although 40% fewer swordfish-directed hooks were set in 1996 than in 1995. Mixed trip CPUE for swordfish increased as well, and Mixed trip hooks set also increased. However lightstick use in Mixed trips barely increased. Mixed trip tuna CPUEs were not as high in 1996 as in 1995.

By-catch of shark remains relatively high in Swordfish and Mixed trips, but relatively low in Tuna trips. However more sharks are retained (primarily as a finned product) on Tuna trips.

Mahimahi was much less available in 1996 compared to 1995, while most other pelagic species were about the same.

Tuna trip CPUEs for albacore and bigeye tuna were higher in 1996 (although tuna trip CPUE for bigeye was not substantially higher than that of Mixed trips). The number of hooks set by Tuna trips was stable between the two years.

Albacore tuna was relatively high in all three trip types.

More detailed information on longline CPUE statistics will be included in the NMFS annual report on the fishery being compiled by Russell Ito, Honolulu Laboratory.

Table 3c. Hawaii longline catch (number of fish caught) by area fished[8], 1995-96.

Species	1995 All Locations	1995 Main Hawaiian Islands EEZ	1995 Outside of U.S. EEZs	1996 All Locations	1996 Main Hawaiian Islands EEZ	1996 Outside of U.S. EEZs
Blue marlin	7,396	4,207	3,189	6,685	3,556	1,878
Striped marlin	22,715	12,580	4,937	15,789	7,163	4,250
Swordfish	37,622	5,273	23,928	38,225	4,634	29,495
Mahimahi	60,748	30,759	23,899	23,331	11,676	9,507
Moonfish	6,416	4,076	1,396	7,315	3,094	1,776
Ono (wahoo)	6,764	2,787	2,868	4,461	1,527	2,116
Sharks	101,773	22,683	58,267	101,002	19,428	64,081
Albacore	46,100	18,363	22,344	57,329	19,259	23,719
Bigeye tuna	60,680	32,253	18,944	63,575	29,803	17,588
Yellowfin tuna	23,798	13,078	6,502	17,586	7,715	6,227
Number of hooks set x 1,000	**14,155**	**7,112**	**4,893**	**14,141**	**5,901**	**5,152**

Data: Catch is *Number Caught* based on Federal logbooks filed by domestic longliners operating out of Hawaii. The Main Hawaiian Islands (MHI) EEZ (Exclusive Economic Zone) represents all longline catch within 200 miles of the eight main islands of Hawaii, except for the overlap with the Northwestern Hawaiian Islands (NWHI). Catch in other U.S. EEZ areas includes the NWHI 200-mile zone and the EEZ for U.S. possessions in the central and western Pacific (e.g., Wake Island).

Source: Imported from LL96area.cal (4/22/97).

Interpretation: Overall longline fishing effort was essentially the same in 1996 as in 1995. However the locations of that effort changed again. Fishing effort declined within the MHI EEZ in 1996, following an increase in 1995. Fishing effort remained steady outside the U.S. EEZs. More fishing took place in the NWHI EEZ in 1996.

As can be seen, most bigeye tuna is caught within the MHI EEZ, as is most mahimahi. However most albacore is caught outside the combined Hawaii EEZ, as are most sharks.

More detailed information on longline catch and effort statistics will be included in the NMFS annual report on the fishery being compiled by Russell Ito, Honolulu Laboratory.

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[8] Only the two areas with the largest catch are tabled here (hence the total is not equal to the two sub-component columns).

Table 4a. Average estimated round weight (in pounds) of fish by gear type, 1987-96.

Year	Non-Tuna PMUS					Tunas			
	Swordfish	Blue marlin	Striped marlin	Mahimahi	Wahoo (ono)	Albacore	Bigeye	Skipjack (aku)	Yellowfin
				Longline					
1987	129	161	66	21	33	62	76	--	82
1988	119	157	57	20	32	60	83	--	103
1989	131	165	62	23	35	62	77	--	104
1990	148	198	62	19	36	61	80	--	122
1991	155	175	59	15	32	52	85	20	118
1992	178	175	66	11	35	45	77	17	99
1993	172	157	64	13	33	44	88	17	92
1994	163	171	64	12	34	41	81	18	97
1995	171	157	58	10	31	50	79	18	95
1996	**157**	**154**	**58**	**17**	**31**	**53**	**64**	**17**	**80**
Average	152	167	62	16	33	53	79	18	99
Standard	20	13	3	5	2	8	6	1	14

Data: Longline data are from NMFS Honolulu Laboratory market monitoring. Where fish are presented in less than whole form, conversion factors are applied to convert to whole weight. This is not frequent for longline landings (except for swordfish). Sharks are not included in this average weight table because of inadequate samples (most shark is "landed" only as a finned product.)

Data source: Imported from LL96a.RYI (4/17/97) Average weights in this table were updated after calculation of total landings for 1995 and 1996.

Interpretation: No substantial changes in average weights of longline-caught pelagic species are identified by this table. More detailed analysis of weight composition is found in NMFS annual longline monitoring reports. Swordfish landings were somewhat below average, but this may reflect the lack of targetting (swordfish is an incidental catch in tuna-directed trips).

Table 4b. Average estimated round weight (in pounds) of fish for troll-handline-other gears, 1987-96.

	Non-Tuna PMUS					Tunas			
Year	Swordfish	Blue marlin	Striped marlin	Mahimahi	Ono (wahoo)	Albacore	Bigeye	Skipjack (aku)	Yellowfin
	Troll-Handline-Other								
1987	126	215	66	21	24	33	14	7	32
1987	124	181	64	18	25	64	34	7	32
1988	107	188	68	21	25	55	24	11	44
1989	97	248	76	20	25	58	25	7	41
1990	122	197	63	15	23	53	29	9	34
1992	75	215	70	14	26	53	28	6	27
1993	139	182	67	14	24	55	22	7	44
1994	95	233	67	14	27	53	30	9	37
1995	110	204	61	16	24	22	18	7	30
1996	**86**	**195**	**65**	**16**	**23**	**42**	**24**	**12**	**42**
Average	108	206	67	17	25	49	25	8	36
Standard Deviation	20.0	22.1	4.2	2.9	1.3	12.7	5.9	2.0	6.2

Data: Troll-handline-other gear data are from HDAR commercial catch reports (*pounds caught* divided by *number caught* where *number caught* > *0*). Correction cannot be made for weights of processed fish (e.g., headed and gutted) which might have been recorded in processed form. Average weight is calculated as Pounds Caught *divided by* Number Caught. *Other* gear represents all other gears except troll, handline, longline, and baitboat. In 1995 albacore landings and weights are strongly influenced by distant-water albacore troll landings.

Data source: annual GASyr.dbf (4/10/97)

Interpretation: All species caught by trolling, handline, or other gears are within their recent ranges, except for albacore. Albacore are much lower in size in 1995 due to substantial landings in Honolulu by distant-water albacore trollers, which tend to catch smaller fish than the other gears.

Table 5a. Hawaii longline vessel activity (trips), 1991-1996.

Year	Total Trips	Tuna Trips	Mixed Trips	Swordfish Trips
1991	1,670	556	823	291
1992	1,265	458	530	277
1993	1,192	542	331	319
1994	1,106	568	228	310
1995	1,125	682	307	136
1996	**1,100**	**657**	**351**	**92**
Average	**1,243**	**577**	**428**	**238**
Standard Deviation	**218**	**82**	**217**	**98**

Data: Data compiled by the NMFS Honolulu Laboratory's Fishery Monitoring & Economics Program from NMFS Federal logbooks. Type of trip is usually determined by interview with the vessel captain or occasionally by FMEP staff interpretation of salient characters from fishing vessel gear design, fishing locations, and catch composition. Detailed longline effort data is only available beginning in the 1991 calendar year when Federal logbooks went into effect.

Source: Imported from LL96trip.cal (4/22/97)

Interpretation: This table shows the steady decline in the number of longline trips in Hawaii since the moratorium on new entry in 1991. It also shows the dramatic shift from swordfish-targeted trips toward tuna (primarily bigeye tuna) in 1995. As a result of this shift, interpretation of longline catch statistics should reflect the changing nature of longline targetting practices.

Table 5b. Hawaii longline vessel activity (miles to first set and days fishing), 1991-1996.

Year	All Trips			
	Average		Maximum	
	Miles to first set	Days fishing	Miles to first set	Days fishing
1991	318	7.6	1,792	22
1992	424	9.5	1,871	26
1993	465	10.3	2,122	29
1994	430	10.0	2,814	26
1995	441	10.2	2,097	27
1996	**367**	**10.5**	**2,037**	**30**
Average	416	9.5	2,139	26
Standard Deviation	50	1.0	331	3

Year	Average					
	Tuna Trips		Mixed Trips		Swordfish Trips	
	Miles to first set	Days fishing	Miles to first set	Days fishing	Miles to first set	Days fishing
1991	240	7.7	276	6.3	585	10.7
1992	260	8.4	404	7.8	733	12.7
1993	222	8.8	522	9.6	820	13.7
1994	252	8.9	323	8.0	833	13.4
1995	273	10.0	397	9.3	884	13.2
1996	**284**	**10.3**	**410**	**10.3**	**790**	**12.7**
Average	249	8.8	384	8.2	771	12.7
Standard Deviation	21	0.9	77	1.3	96	1.0

Year	Maximum					
	Tuna Trips		Mixed Trips		Swordfish Trips	
	Miles to first set	Days fishing	Miles to first set	Days fishing	Miles to first set	Days fishing
1991	1,508	18.0	1,408	22.0	1,792	26.0
1992	1,156	14.0	1,543	21.0	1,871	26.0
1993	1,432	14.0	1,616	23.0	2,122	29.0
1994	945	16.0	1,298	19.0	2,814	26.0
1995	945	20.0	1,609	26.0	2,097	27.0
1996	**1,866**	**28.0**	**1,547**	**30.0**	**2,037**	**28.0**
Average	1,197	16.4	1,495	22.2	2,139	26.8
Standard Deviation	333	4.9	114	3.6	331	1.2

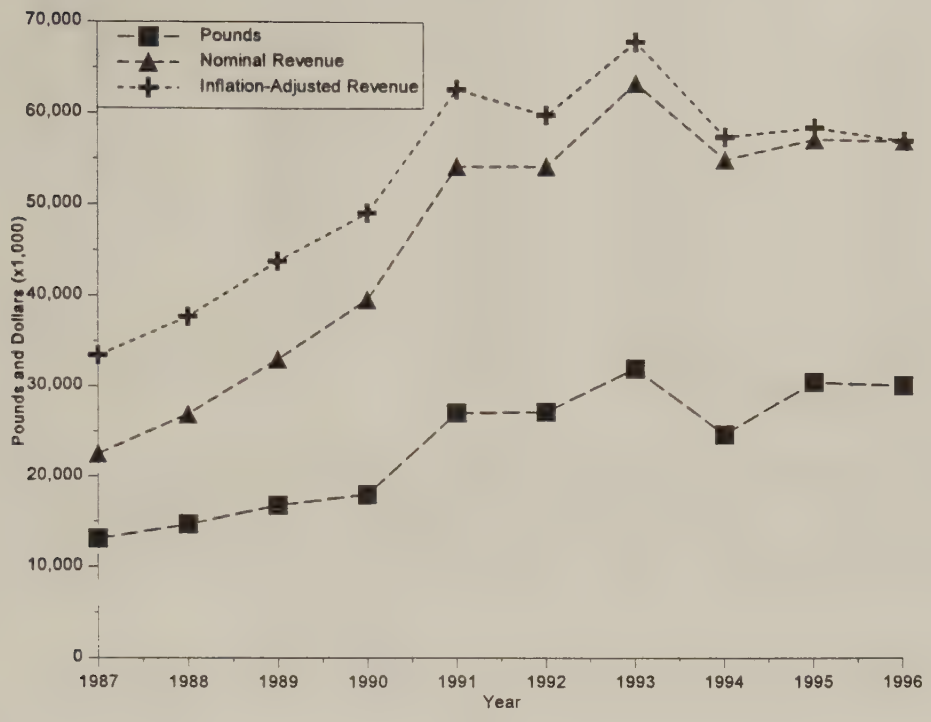
Interpretation: These tables show no dramatic changes for fishing activity by any of the three trip types. Average miles to first set and days fished for tuna and mixed trips were slightly above average in 1996. The furthest distant tuna trip occurred in 1996 by a substantial amount (1,866 miles from Honolulu) but the other trip types were within their norms.

Data: Data compiled by the NMFS Honolulu Laboratory's Fishery Monitoring & Economics Program from NMFS Federal logbooks. Type of trip is determined by FMEP staff through interviews with vessel captains or categorization of fishing operations (Beginning in 1996, a new variable was created on the longline logbook concerning target per set. These data are not included in this report).

Miles to first set is determined as the distance from Honolulu to the first set as recorded on the logbook. Average days fishing is determined by the number of days on which sets and hauls occurred on an individual trip.

Source: NMFS Honolulu Laboratory FMEP programming (7/14/97).

Figure 1. Hawaii commercial pelagic landings and revenue (all gears and pelagic species)



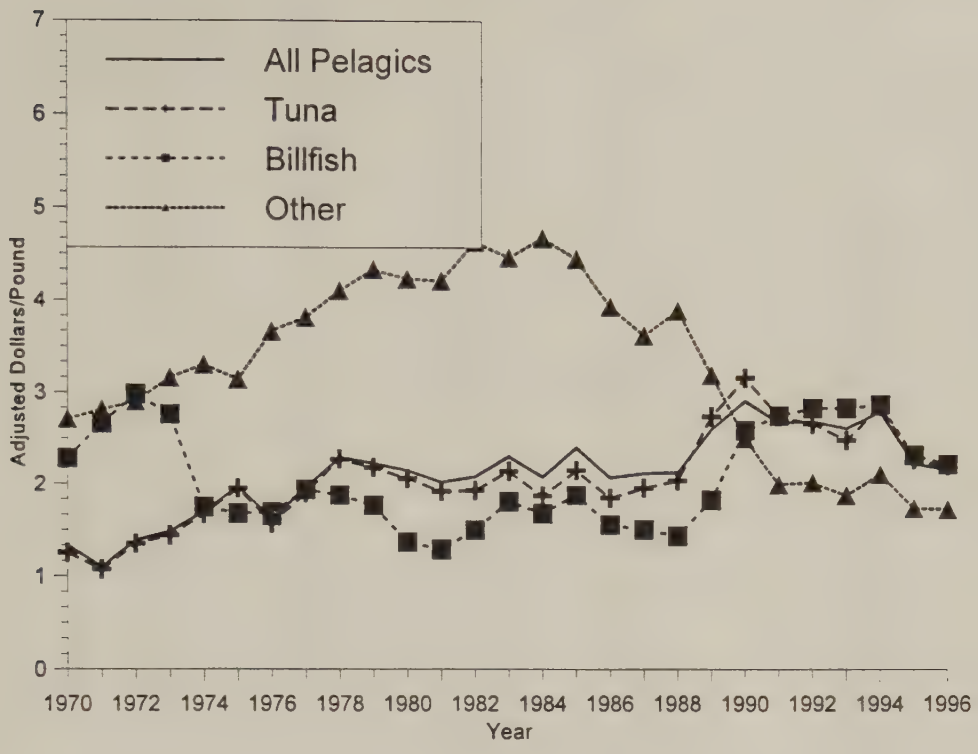
Year	Pounds (x 1,000)	Nominal Revenue (x$1,000)	Adjusted Revenue (x $1,000)	Honolulu Consumer Price Index (W)
1987	13,100	22,500	33,410	115.90
1988	14,700	26,900	37,699	122.80
1989	16,800	33,000	43,788	129.70
1990	18,000	39,600	49,065	138.90
1991	27,100	54,200	62,645	148.90
1992	27,200	54,200	59,832	155.90
1993	32,000	63,400	67,898	160.70
1994	24,700	55,000	57,471	164.70
1995	30,500	57,200	58,457	168.40
1996	**30,100**	**57,000**	**57,000**	**172.10**
Mean	23,400	46,300	52,700	147.80
Standard Deviation	6,700	13,800	10,700	18.93

Data: Data are compiled from Hawaii Division of Aquatic Resources (HDAR) commercial catch reports for non-longline landings and from NMFS estimates of longline landings. Inflation-adjusted revenue is computed from the Honolulu consumer price index (CPI) as: (Current year CPI / data year CPI) * data year nominal price (or nominal revenue).

Data Source: HTOT96a.cal (4/17/97).

Interpretation: Total pelagic landings and revenue data show the effect of the dramatic increase in longline landings from the mid-1980s through 1993 and the general stabilization of landings and revenue since then. Gear-specific changes are considered in later figures.

Figure 2. Inflation-adjusted[1] ex-vessel pelagic prices



[1] Nominal annual average prices adjusted for inflation to most current year Honolulu consumer price index level. (All data must be updated annually.)

Inflation-adjusted ex-vessel pelagic prices [1]

Year	All Pelagics	Tuna	Billfish	Other
1970	1.33	1.25	2.28	2.71
1971	1.10	1.07	2.66	2.81
1972	1.39	1.35	2.98	2.90
1973	1.48	1.44	2.76	3.16
1974	1.70	1.67	1.75	3.30
1975	1.97	1.95	1.68	3.14
1976	1.62	1.57	1.69	3.66
1977	1.96	1.90	1.94	3.81
1978	2.29	2.27	1.88	4.10
1979	2.23	2.18	1.77	4.33
1980	2.15	2.06	1.37	4.23
1981	2.02	1.92	1.29	4.21
1982	2.08	1.93	1.50	4.63
1983	2.30	2.14	1.81	4.46
1984	2.08	1.87	1.68	4.67
1985	2.40	2.15	1.88	4.45
1986	2.07	1.85	1.56	3.93
1987	2.12	1.96	1.51	3.62
1988	2.13	2.04	1.44	3.89
1989	2.60	2.74	1.83	3.19
1990	2.91	3.16	2.59	2.50
1991	2.67	2.74	2.75	2.00
1992	2.69	2.66	2.83	2.02
1993	2.61	2.48	2.83	1.88
1994	2.79	2.85	2.87	2.11
1995	2.23	2.27	2.32	1.74
1996	**2.16**	**2.20**	**2.22**	**1.73**
Average	2.11	2.06	2.06	3.30
Standard Deviation	0.45	0.49	0.53	0.94

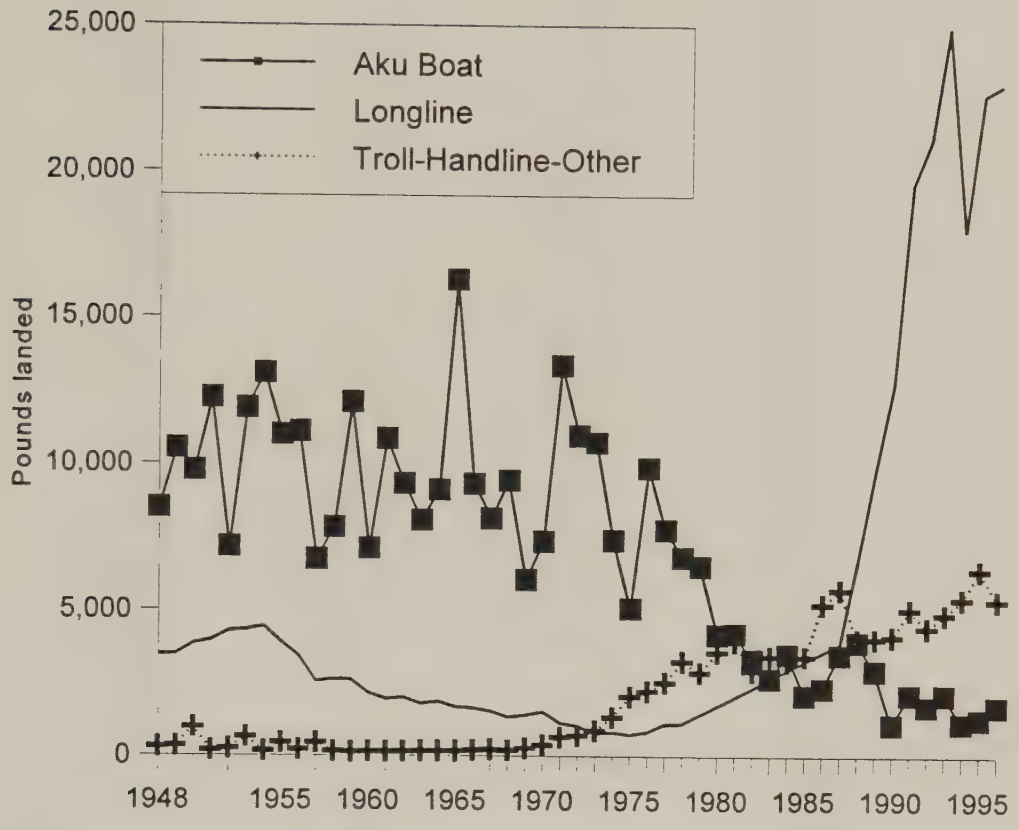
Data: Data are compiled from Hawaii Division of Aquatic Resources (HDAR) commercial catch reports. Nominal price is calculated as (ex vessel) revenue / pounds sold. Inflation-adjusted price is calculated from the Honolulu consumer price index (CPI) as: (Current year CPI / data year CPI) * data year nominal price. No adjustment is made in this table for product form (e.g., most swordfish prices in HDAR are reported as headed, gilled, and gutted, not raised to whole weights. This increases the reported average billfish price.

Data source: PPRICE.CAL (4/17/97)

Interpretation: Inflation-adjusted pelagic prices have declined for all major species groups over the past five years from peaks in 1990-91. Since landings have increased, such declines might be expected. However no detailed analysis of pelagic prices movements has been completed.

[1] Each years' inflation-adjusted price data must be updated annually.

Figure 3a. Hawaii commercial pelagic landings by major gear types, 1948-1996



Hawaii Commercial Landings by major gear types, 1948-1975
(continued on next table)

Year	Aku boat	Longline	Troll-Handline-Other
1948	8,496	3,476	297
1949	10,541	3,491	332
1950	9,788	3,859	976
1951	12,264	3,970	183
1952	7,181	4,290	247
1953	11,914	4,332	646
1954	13,104	4,448	161
1955	11,020	3,898	449
1956	11,120	3,443	217
1957	6,765	2,571	453
1958	7,856	2,645	156
1959	12,122	2,636	132
1960	7,138	2,173	150
1961	10,878	1,972	148
1962	9,349	2,022	154
1963	8,096	1,811	171
1964	9,134	1,883	167
1965	16,295	1,707	170
1966	9,339	1,655	198
1967	8,164	1,563	226
1968	9,463	1,353	195
1969	6,072	1,416	273
1970	7,386	1,541	379
1971	13,393	1,151	654
1972	11,001	1,055	710
1973	10,766	778	885
1974	7,427	830	1,347
1975	5,088	746	2,060

Hawaii Commercial Pelagic Landings by major gear types, 1976-1996

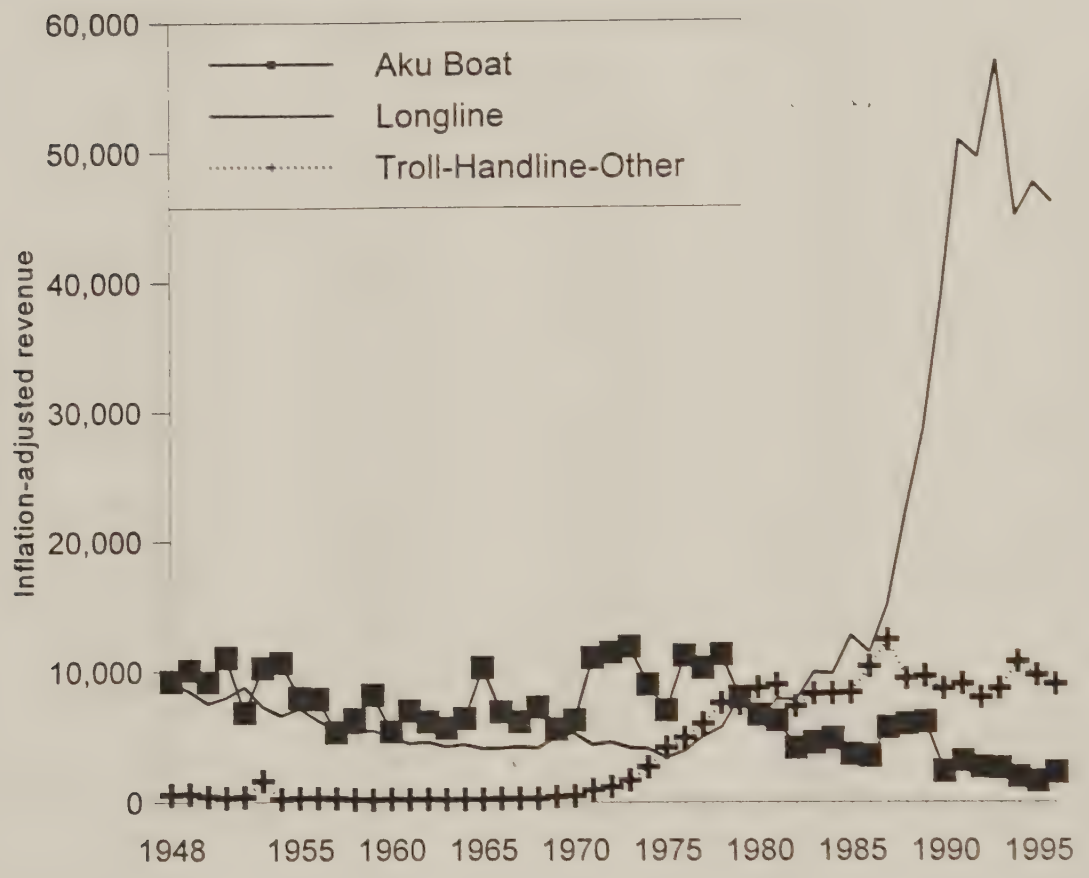
Year	Aku Boat	Longline	Troll-Handline-Other
1976	9,896	838	2,241
1977	7,780	1,101	2,548
1978	6,849	1,125	3,272
1979	6,549	1,432	2,889
1980	4,194	1,740	3,592
1981	4,229	2,047	3,947
1982	3,342	2,355	2,941
1983	2,683	2,663	3,442
1984	3,527	2,970	3,257
1985	2,114	3,278	3,439
1986	2,351	3,585	5,232
1987	3,503	3,893	5,737
1988	3,943	6,733	4,038
1989	2,962	9,844	4,046
1990	1,116	12,790	4,128
1991	2,146	19,600	5,054
1992	1,736	21,120	4,439
1993	2,137	24,980	4,898
1994	1,158	17,990	5,422
1995	1,290	22,660	6,412
1996	1,722	23,010	5,363

Data: NMFS compilation based on HDAR commercial catch reports for all non-longline gears and NMFS estimates of longline landings from 1979 to present.

Data source: HTOT96A.cal (4/17/97)

Interpretation: This graph shows the long-term decline of the baitboat (Pole-and-line skipjack tuna) fleet from the immediate post World War II period, beginning in the mid-1970s. It also shows the rise of the commercial troll and handline pelagic fisheries in the mid-1979s and the recovery and subsequent rapid rise of the longline fishery in the mid-1980s. The longline fishery is now by far the largest fishery in Hawaii.

Figure 3b. Hawaii commercial pelagic inflation-adjusted ex-vessel revenue by major gear types, 1948-1996



Inflation-adjusted Revenue, Hawaii commercial pelagic fishery by major gear type, 1948-1996[1]

Year	Aku boat	Longline	Troll-Handline-Other
1948	9,248	9,249	558
1949	10,108	8,484	602
1950	9,215	7,537	421
1951	11,080	8,007	316
1952	6,875	8,822	391
1953	10,285	7,322	1,618
1954	10,684	6,624	218
1955	8,008	7,153	310
1956	7,896	6,261	318
1957	5,338	5,533	290
1958	6,362	5,273	213
1959	8,200	5,472	170
1960	5,388	4,999	221
1961	6,989	4,469	199
1962	6,146	4,593	216
1963	5,661	4,212	206
1964	6,381	4,401	210
1965	10,293	4,073	207
1966	6,889	4,137	265
1967	6,132	4,219	281
1968	7,232	4,138	294
1969	5,607	5,006	418
1970	6,251	5,264	480
1971	11,042	4,388	919
1972	11,453	4,554	1,153
1973	11,906	4,157	1,665
1974	8,994	4,067	2,675
1975	7,021	3,404	4,147

(Table continued on next page)

Inflation-adjusted Revenue, Hawaii commercial pelagic fishery by major gear type, 1948-1996 (cont)

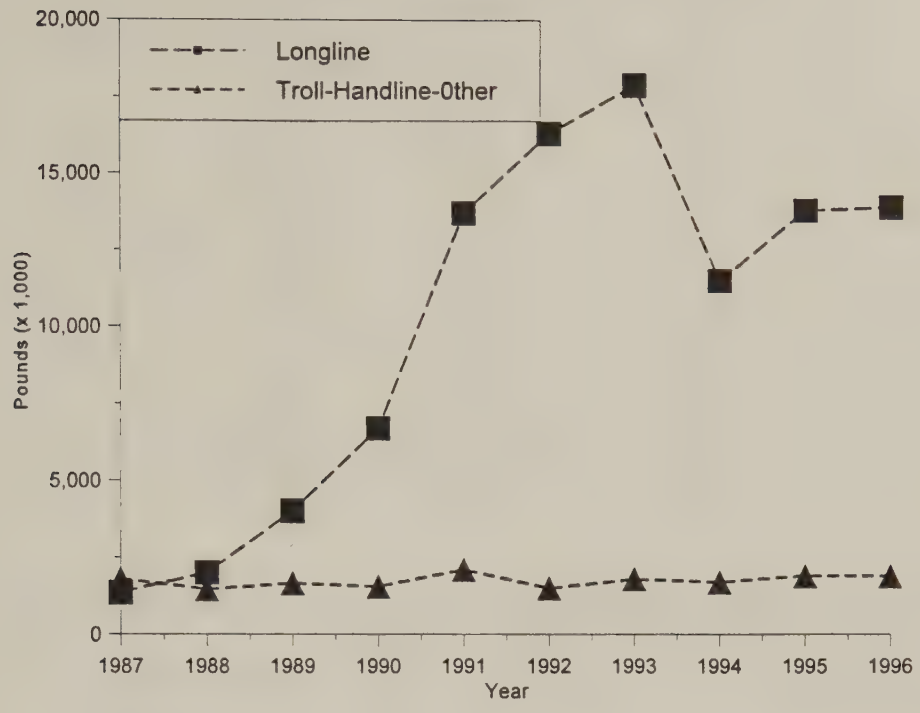
Year	Aku boat	Longline	Troll-Handline-Other
1976	11,211	3,920	4,913
1977	10,290	5,021	5,977
1978	11,289	5,741	7,567
1979	8,018	8,127	7,444
1980	6,671	6,027	8,716
1981	6,240	7,883	8,959
1982	4,146	7,768	7,298
1983	4,522	9,893	8,249
1984	4,838	9,782	8,287
1985	3,641	12,714	8,347
1986	3,514	11,450	10,338
1987	5,667	15,135	12,367
1988	5,932	22,134	9,399
1989	6,125	28,505	9,578
1990	2,348	38,675	8,619
1991	3,128	50,580	8,996
1992	2,666	49,291	7,934
1993	2,586	56,654	8,627
1994	1,917	44,796	10,674
1995	1,584	47,302	9,625
1996	**2,261**	**45,790**	**8,946**

Data: Combination of HDAR commercial catch reports for non-longline gears and NMFS estimates for longline.

Data source: HTOT96a.cal (4/17/97)

Interpretation: On an inflation-adjusted revenue basis, the dominance of the local market in the late 1980s and into the 1990s by the longline fishery in Hawaii is accentuated. Approximately 80% of all commercial pelagics revenue derived from the longline fishery in 1996, compared to less than 30% in 1980.

Figure 4. Hawaii commercial billfish and other non-tuna PMUS landings by gear type, 1987-1996



Hawaii commercial billfish and other non-tuna PMUS landings by gear type, 1987-1996

Pounds Landed (x 1,000)

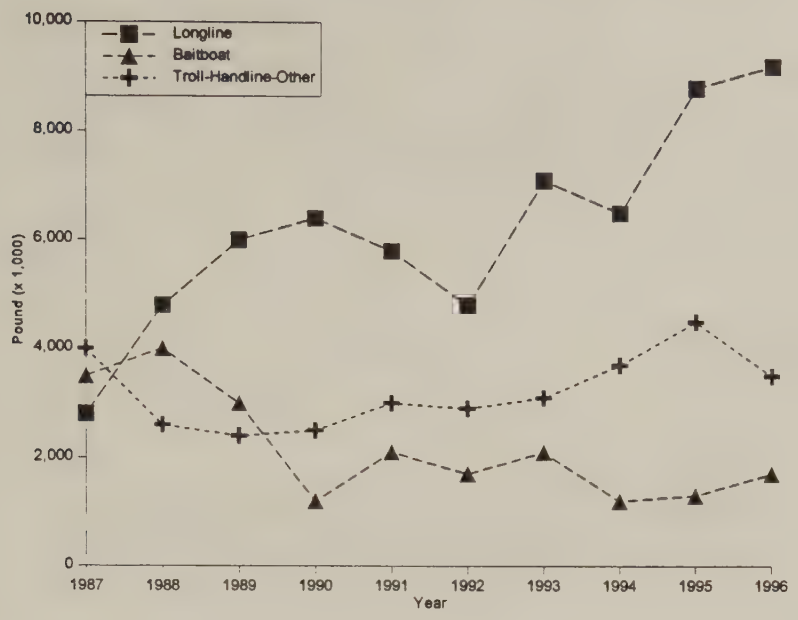
Year	Longline	Troll & Handline
1987	1,350	1,800
1988	2,000	1,450
1989	4,000	1,650
1990	6,700	1,550
1991	13,700	2,100
1992	16,300	1,500
1993	17,900	1,800
1994	11,500	1,700
1995	13,800	1,900
1996	**13,900**	**1,900**
Average	10,115	1,735
Standard Deviation	6,085	204

Data: Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports.

Data Source: N8795P.cal (7/2/96)

Interpretation: The swordfish component of the longline fishery rose rapidly in the early 1990s, with a significant decline in 1994. The apparent "recovery" in 1995 is from other species, not swordfish, which continued to decline as a target in 1995. Troll-handline landings were in their usual range in 1995.

Figure 5. Hawaii commercial tuna landings by gear type, 1987-96



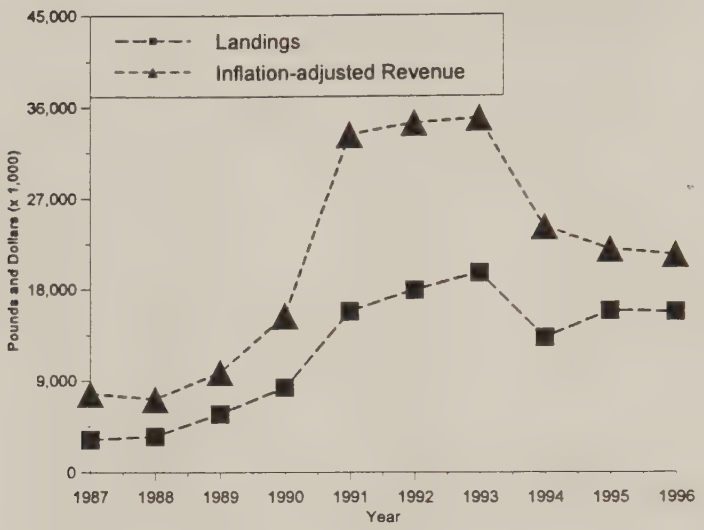
Year	Pounds Landed (x 1,000)		
	Longline	Baitboat (Aku boat)	Troll-Handline-Other
1987	2,800	3,500	4,000
1988	4,800	4,000	2,600
1989	6,000	3,000	2,400
1990	6,400	1,200	2,500
1991	5,800	2,100	3,000
1992	4,800	1,700	2,900
1993	7,100	2,100	3,100
1994	6,500	1,200	3,700
1995	8,800	1,300	4,500
1996	**9,200**	**1,700**	**3,500**
Average	6,220	2,180	3,220
Standard Deviation	1,897	994	691

Data: Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports.

Data Source: P8796N.cal (4/17/97)

Interpretation:Since 1993, longline fishing effort increasingly has focused on tuna as a target species (as described in Ito, 1996). Aku boat landings remained below the recent long-term average. Troll-handline landings of tuna fell slightly but remained slighly above the long-term average.

Figure 6. Hawaii billfish & other non-tuna PMUS landings and revenue, 1987-1996



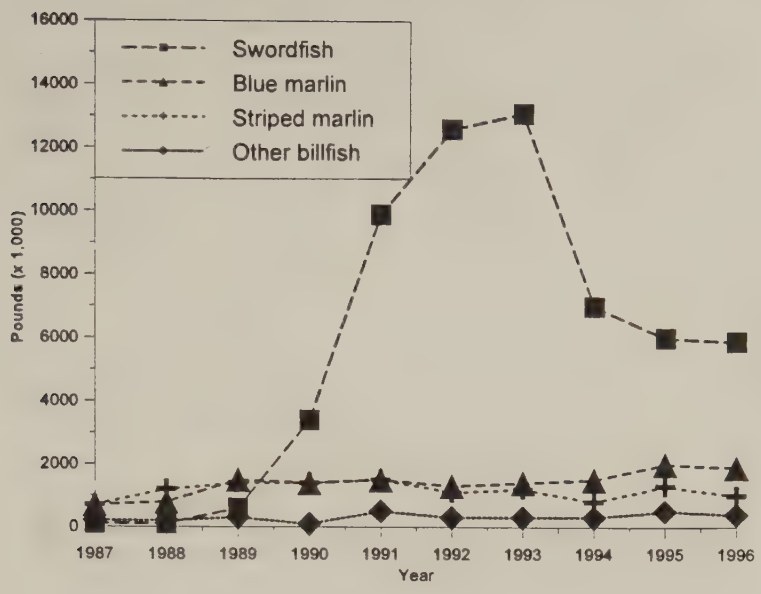
Year	Pounds (x 1,000)	Nominal Revenue ($,1000)	Inflation-adjusted Revenue($1,000)	HCPI
1987	3,200	5,200	7,721	116
1988	3,500	5,100	7,147	123
1989	5,700	7,400	9,819	130
1990	8,300	12,400	15,364	139
1991	15,800	28,800	33,287	149
1992	17,900	31,200	34,442	156
1993	19,600	32,600	34,913	161
1994	13,200	23,100	24,138	165
1995	15,800	21,400	21,870	168
1996	**15,700**	**21,300**	**21,300**	**172**
Average	11,870	18,850	21,000	
Standard Deviation	6,142	10,642	10,857	

Data: Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports.

Data Source: P8795N.cal (4/17/97)

Interpretation: Although there has been marked a significant decline in billfish and non-tuna landings by all gears, most of the decline is attributable to the decline in longline swordfish landings. Swordfish landings have declined due to the longline fleet shifting its target to tuna species (primarily bigeye). The 1996 landings remained above the 10-year average and inflation-adjusted revenue is at the long-term average.

Figure 7. Species composition of Hawaii commercial billfish landings, 1987-96



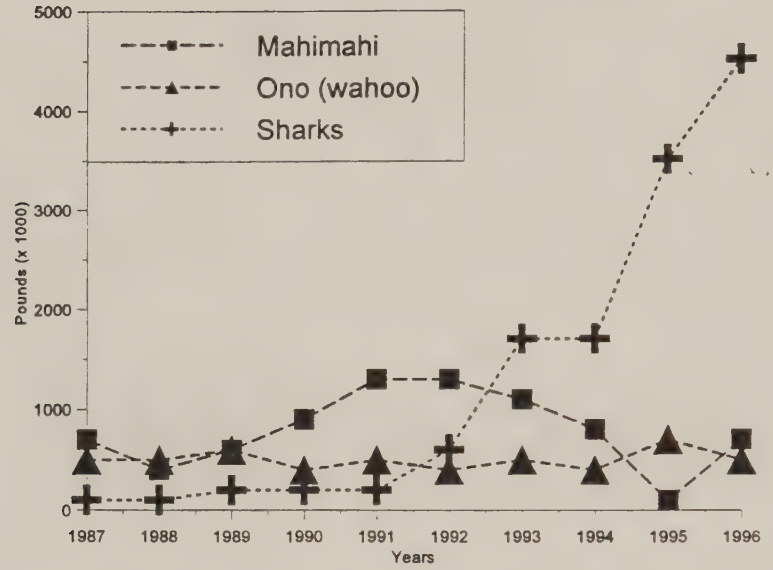
	Pounds Landed (x 1,000)			
Year	**Swordfish**	**Blue marlin**	**Striped**	**Other billfish**
1987	100	700	700	200
1988	100	800	1,200	200
1989	600	1,500	1,400	300
1990	3,400	1,400	1,400	100
1991	9,900	1,500	1,500	500
1992	12,600	1,300	1,100	300
1993	13,100	1,400	1,200	300
1994	7,000	1,500	800	300
1995	6,000	2,000	1,300	500
1996	**5,900**	**1,900**	**1,000**	**400**
Average	5,870	1,400	1,160	310
Standard Deviation	4,894	408	263	129

Data: Species summaries for all gears combined are compiled from HDAR and NMFS landings figures. Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports. Data are rounded to the nearest 100,000 pounds.

Data Source: P8796N.cal (4/17/97).

Interpretation: The swordfish component of the longline fishery rose rapidly in the early 1990s, with a significant decline in 1994 and 1995. Blue marlin landings were above the long-term average. Other species were within their recent ranges. The swordfish decline was caused by the shift in targeting to tuna species.

Figure 8. Hawaii commercial landings -- mahimahi, ono (wahoo), and sharks (whole weight), 1987-1996



Year	Mahimahi	Ono (Wahoo)	Sharks[1]
1987	700	500	100
1988	400	500	100
1989	600	600	200
1990	900	400	200
1991	1,300	500	200
1992	1,100	400	600
1993	800	500	1,700
1994	1,000	400	1,700
1995	1,000	700	3,500
1996	**700**	**500**	**4,500**
Average	850	500	1,280
Standard Deviation	264	94	1,577

Data: Species summaries for all gears combined are compiled from HDAR and NMFS landings figures. Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports. Data are rounded to the nearest 100,000 pounds. Shark landings represent reported weights for troll-handline-other gears and NMFS estimates of round or whole weights for longline-caught shark, including sharks "finned" (where only the fins are retained and the carcasses are discarded at sea).

Data Source: P8796N.cal (4/17/97)

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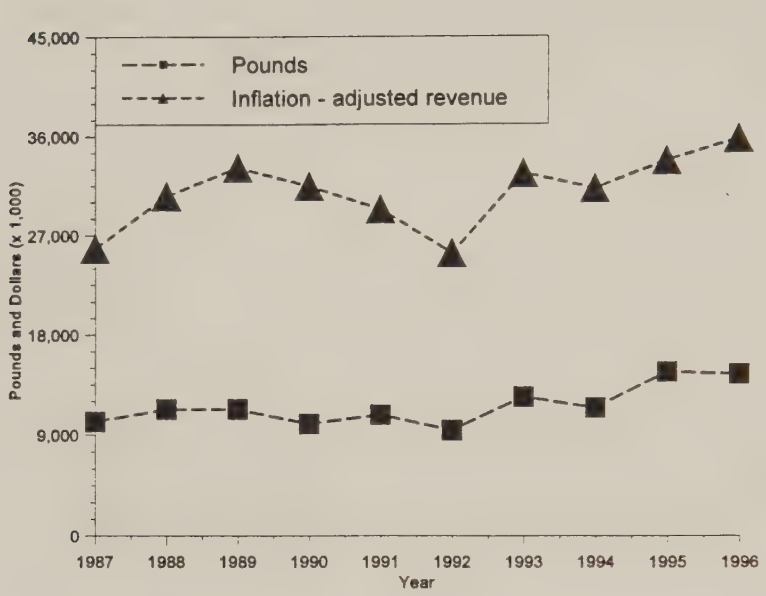
[1] Shark whole-weight estimate. Most shark is landed as a finned product.

Interpretation: Mahimahi and ono landings are within their recent ranges. In 1996, 101,000 sharks were caught, of which 43,700 were kept: only 629 sharks were kept as *whole* shark product and the remainder were processed as a finned product. Shark fins are estimated to weigh 65,100 pounds in processed weight while the whole sharks totaled 90,500 pounds. Estimated *round* weight of all sharks "kept" (including finned sharks "raised" to whole weights) was 4.3 million pounds.

Figure 9. Hawaii tuna landings and revenue, 1987-96



Year	Pounds Landed (x 1,000)	Nominal Revenue x $1,000	Inflation-adjusted Revenue x $1,000	HCPI
1987	10,200	17,400	25,837	115.90
1988	11,300	21,800	30,552	122.80
1989	11,300	25,000	33,173	129.70
1990	10,000	25,400	31,471	138.90
1991	10,800	25,400	29,358	148.90
1992	9,400	23,000	25,390	155.90
1993	12,400	30,500	32,664	160.70
1994	11,400	29,900	31,243	164.70
1995	14,600	33,000	33,725	168.40
1996	**14,400**	**35,700**	**35,700**	**172.10**
Average	11,580	26,710	30,911	
Standard Deviation	1,754	5,536	3,304	

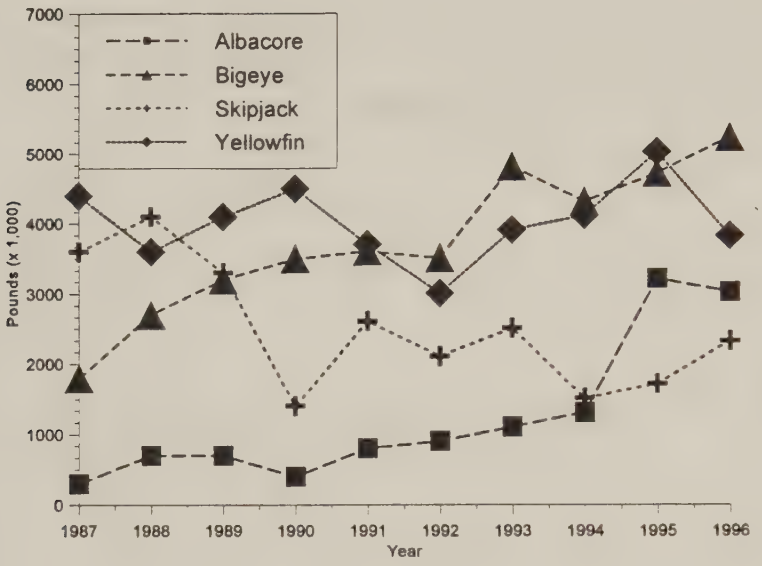
Data: Commercial landings and ex vessel revenue for all gears combined are compiled from HDAR and NMFS figures. Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports. Data are rounded to the nearest 100,000 pounds. Inflation-adjusted revenue bases previous year's revenues on the current year (1996) Honolulu consumer price index (HCPI).

Data Source: P8796n.cal (4/17/97)

Interpretation: Tuna landings in the Hawaii commercial fishery are the highest since the tuna cannery closed (1984).[2] Nominal and inflation-adjusted ex vessel revenue were at record levels. Troll-handline-other landings of tuna are about average for the recent period (down from 1994-95 but above 1992-93) . Aku boat (pole-and-line skipjack tuna) landings remain depressed but significantly above the last two years as new investment is beginning to enter that sector. Longline landings of tuna are at historic highs for Hawaii.

[2] Total tuna landings were 14,700,000 pounds (sold) in 1970, of which over half was from the pole-and-line aku boat fleet.

Figure 10. Species composition of Hawaii commercial tuna landings, 1987-96



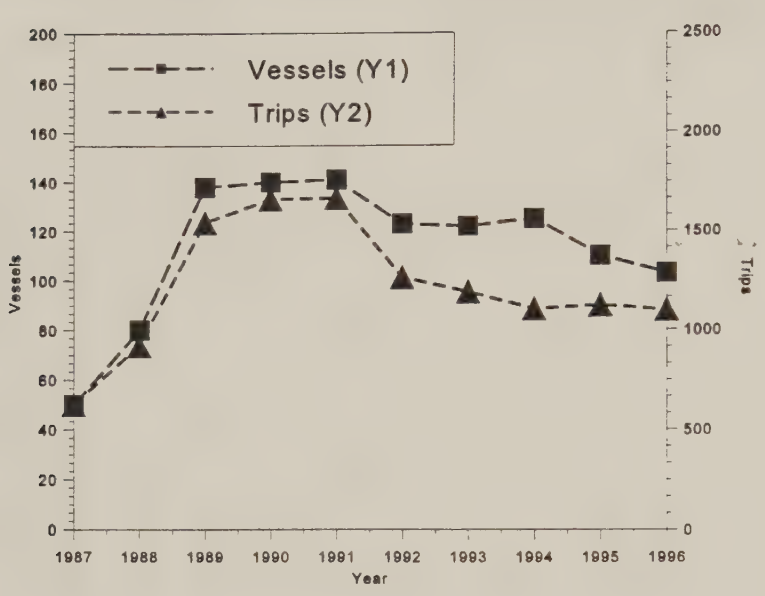
Year	Pounds Landed (x 1,000)			
	Albacore	Bigeye	Skipjack (aku)	Yellowfin
1987	300	1,800	3,600	4,400
1988	700	2,700	4,100	3,600
1989	700	3,200	3,300	4,100
1990	400	3,500	1,400	4,500
1991	800	3,600	2,600	3,700
1992	900	3,500	2,100	3,000
1993	1,100	4,800	2,500	3,900
1994	1,300	4,300	1,500	4,100
1995	3,200	4,700	1,700	5,000
1996	**3,000**	**5,200**	**2,300**	**3,800**
Average	1,240	3,730	2,510	4,010
Standard Deviation	1,024	1,041	864	522

Data: Species summaries for all gears combined are compiled from HDAR and NMFS landings figures. Longline data are compiled from NMFS estimates. Troll-handline-other pelagics data are compiled from HDAR commercial catch reports. Data are rounded to the nearest 100,000 pounds.

Data Source: P8796N.cal (4/17/97)

Interpretation: Albacore, bigeye, and yellowfin landings were at or near recent peaks in the past two years. Longline landings of albacore have increased dramatically over the past three years. Other species are within their recent ranges.

Figure 11. Hawaii longline vessel activity, 1987-96



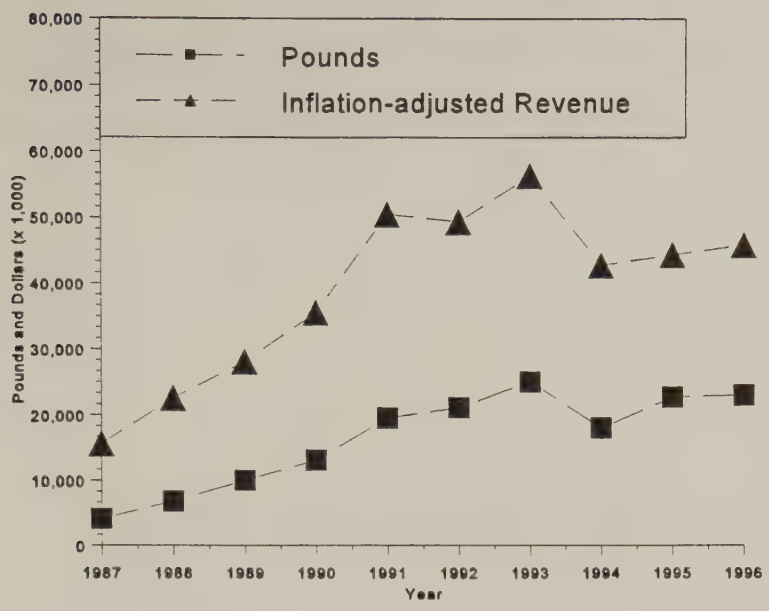
Year	Active Vessels	Trips
1987	37	435
1988	50	627
1989	80	923
1990	138	1,546
1991	141	1,670
1992	123	1,265
1993	122	1,192
1994	125	1,106
1995	110	1,125
1996	**103**	**1,100**
Average	103	1,099
Standard Deviation	34	355

Data: Longline fishing effort data are compiled from Federal logbooks collected by the Fishery Monitoring & Economics Program of the NMFS Honolulu Laboratory for the year 1991-present, and by shoreside monitoring by FMEP in earlier years.

Data source: LL96a.cal (4/22/97)

Interpretation: Although the number of active longline vessels has subsided in recent years, they remain above the average for participation since the mid-1980s. Longline trip activity decreased slightly in 1996 and remains substantially below the 1990-91 peak when limited entry into the fishery was introduced.

Figure 12. Hawaii longline landings and revenue, 1987-96



	Pounds (x 1,000)	Nominal Revenue ($1,000)	Adjusted Revenue ($1,000)	Honolulu Consumer Price Index
1987	4,100	10,500	15,591	115.90
1988	6,800	16,100	22,564	122.80
1989	10,000	21,200	28,130	129.70
1990	13,100	28,700	35,560	138.90
1991	19,500	43,700	50,509	148.90
1992	21,100	44,700	49,345	155.90
1993	25,000	52,600	56,331	160.70
1994	18,000	40,900	42,738	164.70
1995	22,700	43,400	44,354	168.40
1996	**23,000**	**45,800**	**45,800**	**172.10**
Average	16,330	34,760	39,092	
Standard Deviation	7,354	14,486	13,236	

Data: Longline landings and ex vessel revenue estimates are compiled by the NMFS Honolulu Laboratory. They represent weight estimates using Federal logbooks (since 1991) and market monitoring average weight per fish and average price per pound. From 1987-1990, estimates rely on NMFS shoreside and market monitoring.

Data Source: P8796N.cal (4/17/97)

Interpretation:
Hawaii longline landings have been stable for the past two years, and still above the 10-year average, following a significant decline from the 1993 peak. Most of the decline was due to the swordfish component of the longline fishery which rose rapidly in the early 1990s, with a significant decline in 1994 as swordfish longliners shifted their effort to tuna or left the fishery. Longline effort directed toward swordfish remains reduced, although catch per unit effort (cpue) has rebounded.

Figure 13. Hawaii longline landings -- billfish (including swordfish), 1987-96

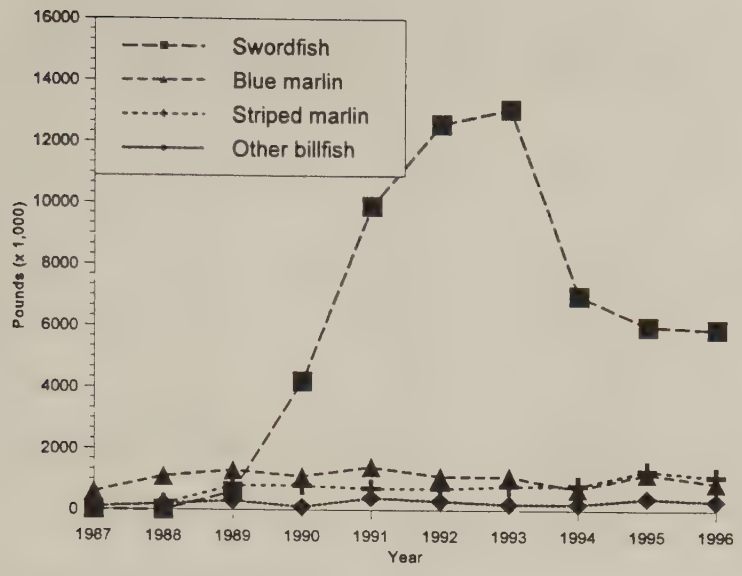
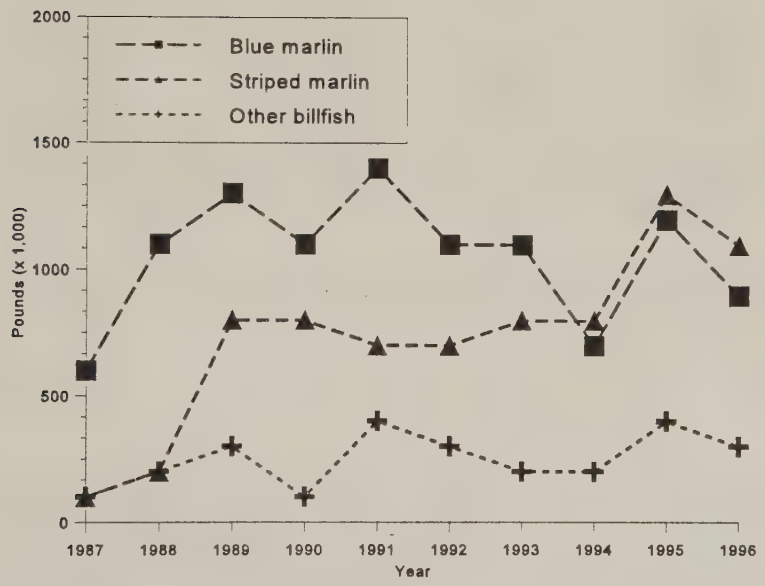


Figure 14. Hawaii longline landings -- marlins & other billfish, 1987-91



Hawaii longline landings -- billfish (including swordfish), 1987-96.

	Pounds Landed (x 1,000)			
	Swordfish	Striped marlin	Blue marlin	Other billfish
1987	0	600	100	100
1988	0	1,100	200	200
1989	600	1,300	800	300
1990	4,200	1,100	800	100
1991	9,900	1,400	700	400
1992	12,600	1,100	700	300
1993	13,100	1,100	800	200
1994	7,000	700	800	200
1995	6,000	1,200	1,300	400
1996	**5,900**	**900**	**1,100**	**300**
Average	5,930	1,050	730	250
Standard Deviation	4,882	251	359	108

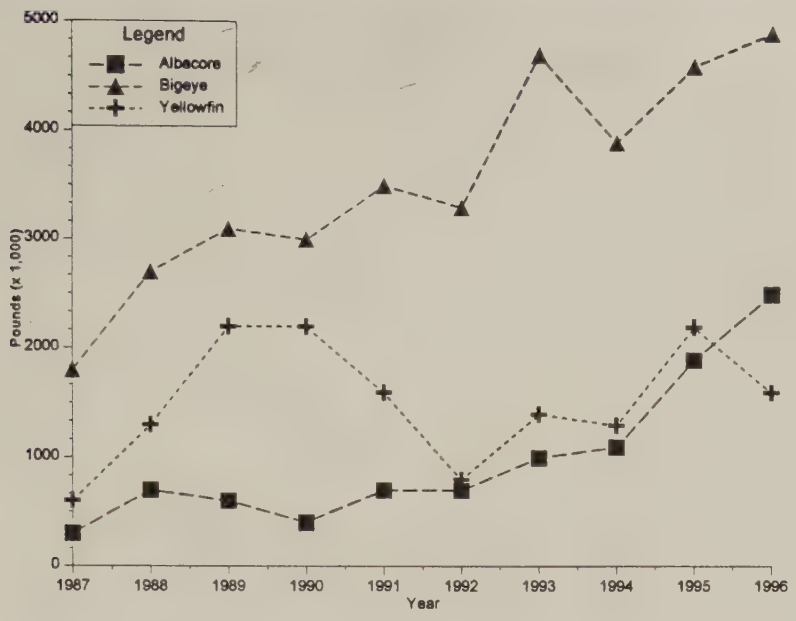
Data: Data are compiled from Federal logbooks and market monitoring information by NMFS Honolulu Laboratory staff.

Data source: LL96a.cal (4/22/97)

Interpretation: Billfish landings (including swordfish) were stable in 1996. However landings of striped marlin declined in 1996 to below its 10-year average. The dramatic decline in swordfish landings in 1994-96 represents a change in vessel targeting practices.[1] Figure 13 shows the decline in swordfish-directed trips and the stability in accompanying catch per unit effort (CPUE). Swordfish remains the largest single species landed by the Hawaii longline fleet, although the ex vessel revenue of bigeye tuna ($19.5 million) exceeds swordfish revenue ($13.8 million). Most swordfish continues to be exported to the mainland U.S. All other species are within their recent ranges although generally above their 10-year averages.

[1] See last year's annual report for a full discussion of the 1994 swordfish CPUE.

Figure 15. Hawaii longline landings -- tunas, 1987-96



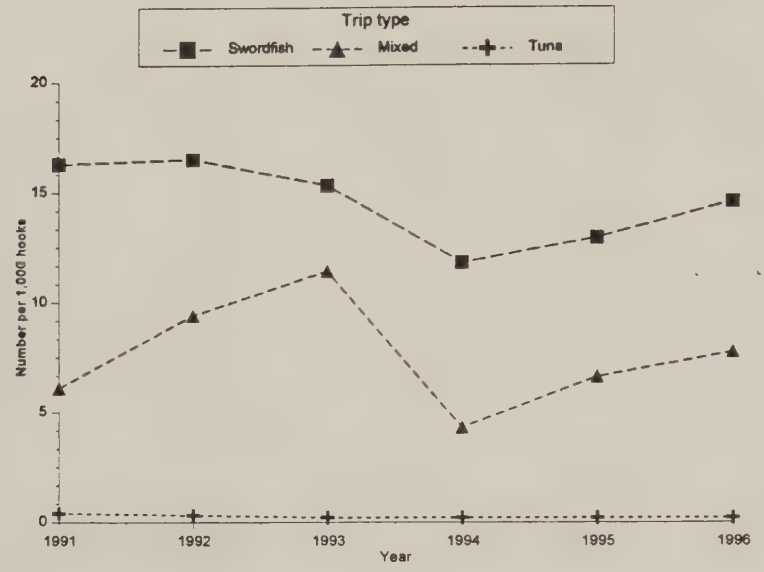
Year	Albacore	Bigeye	Yellowfin
1987	300	1,800	600
1988	700	2,700	1,300
1989	600	3,100	2,200
1990	400	3,000	2,200
1991	700	3,500	1,600
1992	700	3,300	800
1993	1,000	4,700	1,400
1994	1,100	3,900	1,300
1995	2,000	4,600	2,200
1996	**2,500**	**4,900**	**1,600**
Average	1,078	3,744	1,622
Standard Deviation	710	985	565

Data: Data are compiled from Federal logbooks and market monitoring information by NMFS Honolulu Laboratory staff.

Source: P8796N.cal (4/17/97)

Interpretation: All tuna species show increasing landings over the past four years as targeting towards tunas has returned, although 1996 was a relatively low year for yellowfin tuna (which tends to be annually variable in catchability). Albacore show the largest increase, and some trips now target albacore (despite its relatively low price per pound). Longline tuna were $27 million ex vessel (or 47% of total Hawaii landings of all pelagic species by all gears).

Figure 16. Hawaii longline catch rates, swordfish by trip type, 1991-96



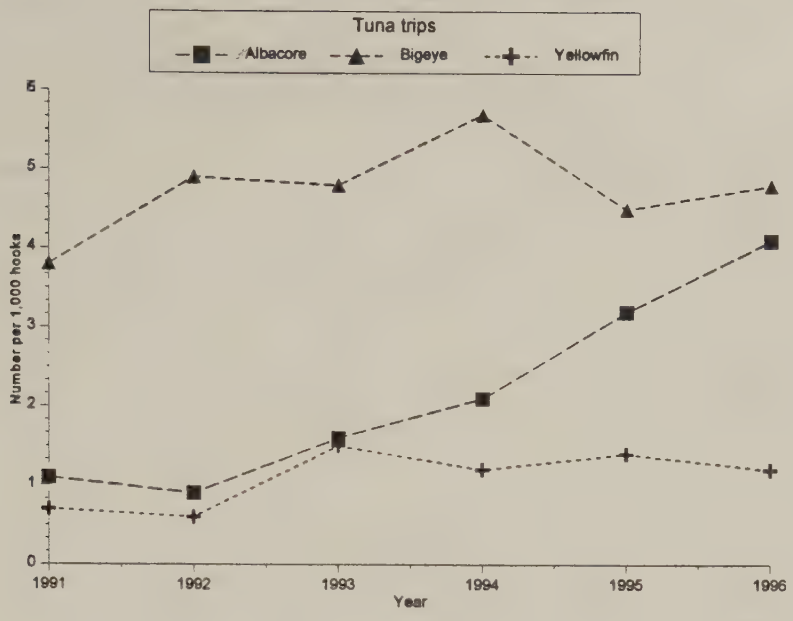
	Swordfish CPUE (number caught per 1,000 hooks)		
Year	Swordfish trips	Mixed trips	Tuna trips
1991	16.3	6.1	0.4
1992	16.5	9.4	0.3
1993	15.3	11.4	0.2
1994	11.8	4.3	0.2
1995	12.9	6.6	0.2
1996	**14.5**	**7.7**	**0.2**
Average	14.5	7.6	0.2
Standard Deviation	1.9	2.5	0.1

Data: Longline catch rates are compiled from Federal logbooks. CPUE is *Number caught* per 1,000 hooks set. Trips are categorized by longline captains (or by NMFS staff in the absence of a longline captain) as targeting Swordfish, Tuna or Mixed (meaning either switching of target during the trip or the absence of an explicit target).

Data source: LL96trip.cal (4/22/97)

Interpretation: Although *aggregate* swordfish CPUE has fallen consistently since 1993, this graph makes clear that there is a tremendous difference between aggregate CPUE (which does not take into account targeting), and trip-type CPUE. Swordfish CPUE on trips which target swordfish declined from 1991 (when the Federal logbook program was initiated) to 1994 and then has largely recovered since then. Mixed trip CPUE shows a much steeper decline in 1994, but a similar recovery. This may reflect changes in Mixed trip targeting behavior. Much more detailed analysis of swordfish CPUE is required in order to make any reasonable interpretation of these "trends". The 1995 annual report contained a preliminary look at these trends.

Figure 17. Hawaii longline catch rates, major tuna species by tuna trips, 1991-96



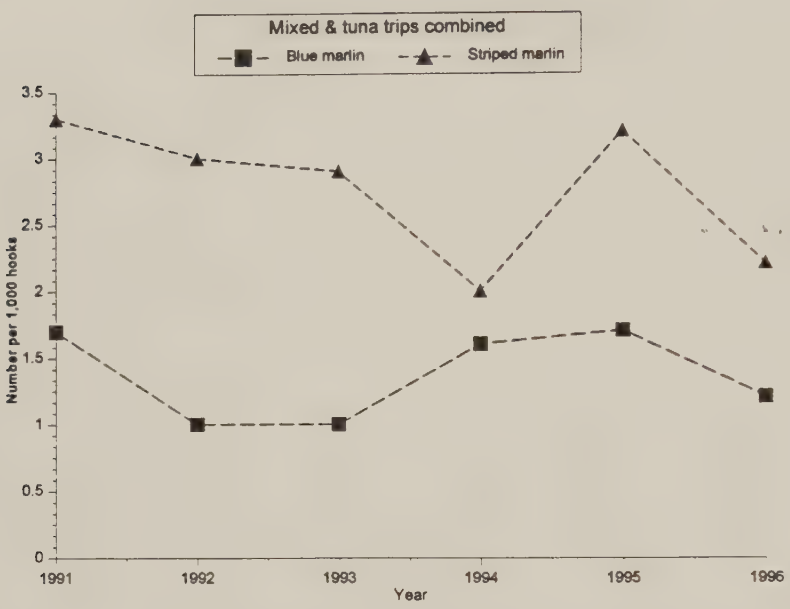
Year	Tuna-trip CPUEs (number caught per 1,000 hooks)		
	Albacore	Bigeye	Yellowfin
1991	1.1	3.8	0.7
1992	0.9	4.9	0.6
1993	1.6	4.8	1.5
1994	2.1	5.7	1.2
1995	3.2	4.5	1.4
1996	**4.1**	**4.8**	**1.2**
Average	2.2	4.7	1.1
Standard Deviation	1.2	0.6	0.4

Data: Longline catch rates are compiled from Federal logbooks. CPUE is *Number caught* per 1,000 hooks set. Trips are categorized by longline captains (or by NMFS staff in the absence of a longline captain) as targeting Swordfish, Tuna or Mixed (meaning either switching of target during the trip or the absence of an explicit target).

Data source: LL96trip.cal (4/22/97)

Interpretation: Tuna-trips provide the most realistic view of tuna species catch rates (CPUEs). Albacore is probably more targeted in 1996, but it appears to be more abundant as well. Bigeye and yellowfin catch rates are within their recent norms.

Figure 18. Hawaii longline catch rates, blue & striped marlin by mixed and tuna trips, 1991-96



Marlin CPUEs (number caught per 1,000 hooks)

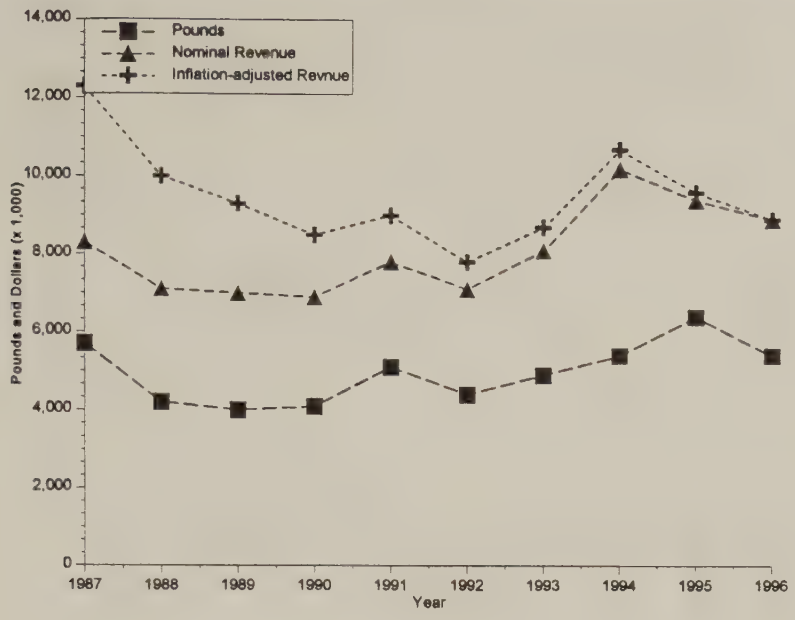
Tuna and Mixed Trips Combined		
Year	**Blue marlin**	**Striped marlin**
1991	1.7	3.3
1992	1.0	3.0
1993	1.0	2.9
1994	1.6	2.0
1995	1.7	3.2
1996	**1.2**	**2.2**
Average	1.4	2.8
Standard Deviation	0.4	0.5

Data: Longline catch rates are compiled from Federal logbooks. CPUE is *Number caught* per 1,000 hooks set. Trips are categorized by longline captains (or by NMFS staff in the absence of a longline captain) as targeting Swordfish, Tuna or Mixed (meaning either switching of target during the trip or the absence of an explicit target).

Data source: LL96trip.cal (4/22/97).

Interpretation: Blue and striped marlin are caught on both tuna-directed and mixed-target longline trips, at roughly similar proportions. Catch rates in 1996 were slightly below their recent averages.

Figure 19. Hawaii troll and handline landings and revenue (all pelagic species).



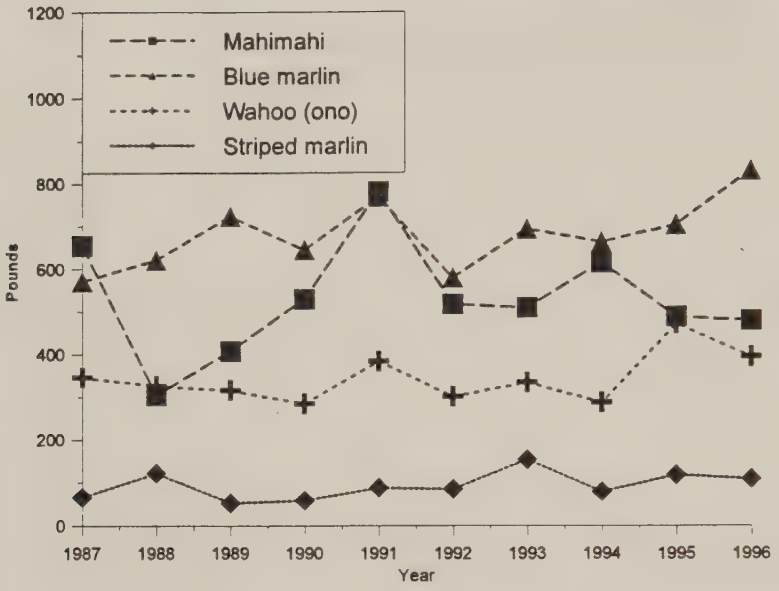
Year	Pounds (x 1,000)	Nominal Revenue ($1,000)	Adjusted Revenue ($1,000)	HCPI
1987	5,700	8,300	12,300	115.90
1988	4,200	7,100	10,000	122.80
1989	4,000	7,000	9,300	129.70
1990	4,100	6,900	8,500	138.90
1991	5,100	7,800	9,000	148.90
1992	4,400	7,100	7,800	155.90
1993	4,900	8,100	8,700	160.70
1994	5,400	10,200	10,700	164.70
1995	6,400	9,400	9,600	168.40
1996	**5,400**	**8,900**	**8,900**	**172.10**
Average	4,960	8,080	9,480	
Standard Deviation	788	1,131	1,279	

Data: Data are compiled from HDAR commercial catch reports.

Data source: P8796N.cal (4/17/97) imported from GASyr.dbf.

Interpretation: Landings and ex-vessel revenue are within their recent ranges for the combined troll-handline fishery and include pelagics caught by miscellaneous other gears (including distant-water albacore trollers off-loading in Honolulu in some years, e.g., 1995).

Figure 20. Hawaii commercial troll and handline landings -- non-tuna PPMUS.



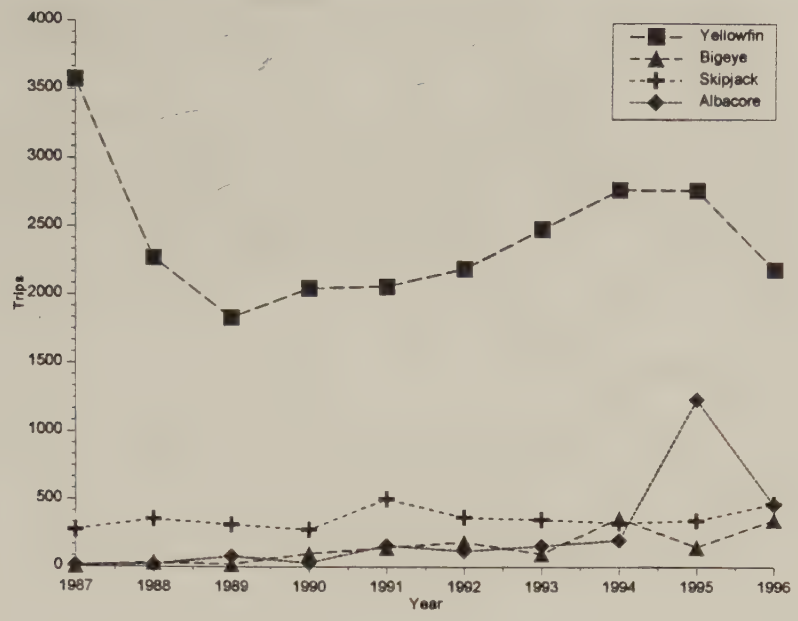
	Pounds Landed (x 1,000)			
Year	Mahimahi	Blue marlin	Ono(wahoo)	Striped
1987	655	571	346	66
1988	304	621	326	122
1989	407	724	316	53
1990	529	645	284	59
1991	781	769	383	88
1992	516	578	300	85
1993	507	691	333	153
1994	612	660	286	78
1995	485	699	468	117
1996	**475**	**825**	**391**	**108**
Average	527	678	343	93
Standard Deviation	132	81	57	32

Data: Data are compiled from HDAR commercial catch reports (pounds landed).

Data source: P8796N.cal (4/17/97) imported from GASyr.dbf

Interpretation: Landings for all non-tuna species are within their recent ranges for the combined troll-handline fishery, except for ono (wahoo) which was above the long-term average for the past two years.

Figure 21. Hawaii commercial troll and handline landings -- tunas



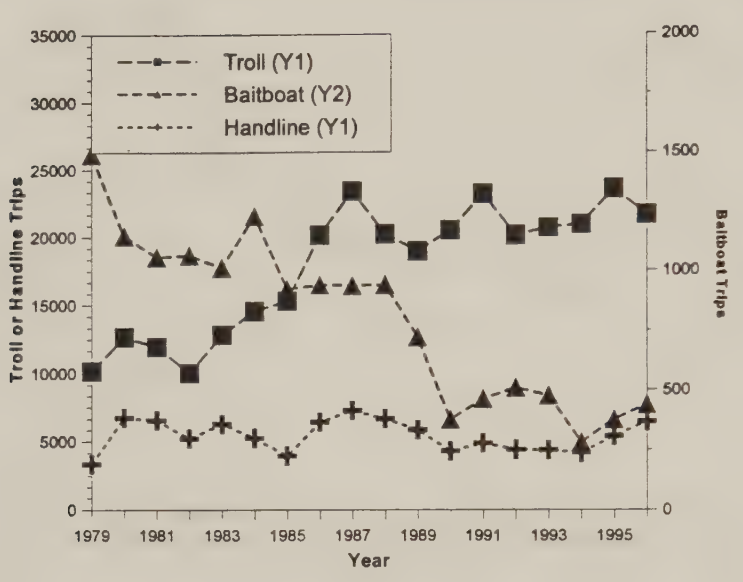
	Pounds Landed (x 1,000)			
Year	**Yellowfin**	**Bigeye**	**Skipjack**	**Albacore**
1987	3,575	6	275	13
1988	2,275	31	355	20
1989	1,837	19	313	79
1990	2,054	97	275	29
1991	2,066	142	504	159
1992	2,198	184	369	120
1993	2,492	98	352	158
1994	2,783	361	326	197
1995	2,778	146	344	1,242
1996	**2,196**	**352**	**471**	**467**
Average	2,425	144	358	248
Standard Deviation	508	126	75	373

Data: Data are compiled from HDAR commercial catch reports.

Data source: P8796N.cal (4/17/97) imported from GASyr.dbf

Interpretation: Landings of the traditional tuna species are within their recent ranges for the combined troll-handline fishery, although yellowfin was lower than it had been for some time. Distant-water albacore landings were not recorded in the amounts experienced in 1995, but albacore has become a more important species for both troll, handline, and longline gears.

Figure 22. Hawaii commercial pelagic trips by non-longline gears

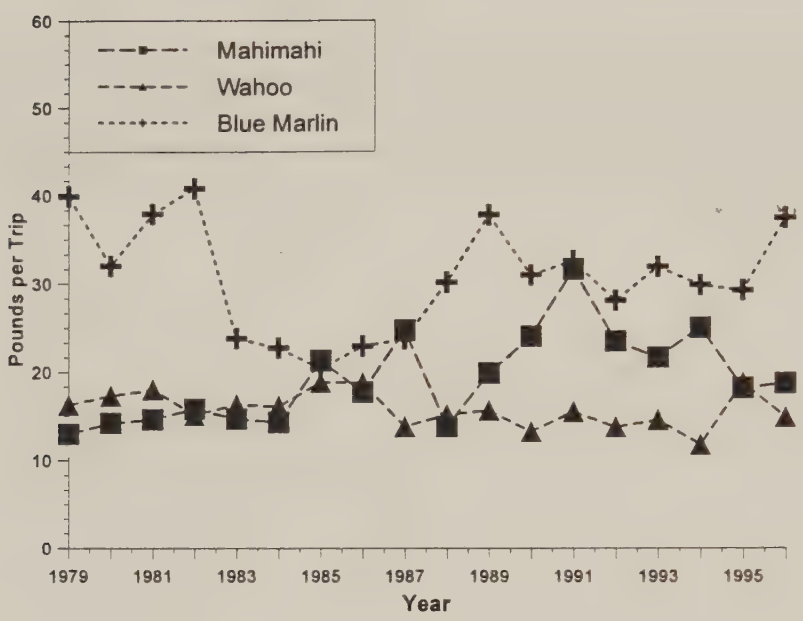


	Number of Trips		
Year	**Troll**	**Baitboat**	**Handline**
1979	10,185	1,495	3,346
1980	12,692	1,149	6,746
1981	11,975	1,059	6,562
1982	10,039	1,067	5,219
1983	12,842	1,014	6,275
1984	14,556	1,232	5,248
1985	15,291	924	3,929
1986	20,139	941	6,412
1987	23,391	938	7,263
1988	20,202	941	6,647
1989	18,924	723	5,834
1990	20,468	378	4,261
1991	23,184	463	4,861
1992	20,109	510	4,374
1993	20,647	477	4,343
1994	20,905	281	4,142
1995	23,527	376	5,357
1996	**21,611**	**438**	**6,416**
Average	17,816	800	5,402
Standard Deviation	4,665	353	1,163

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: Trolling activity continued at a high level of between 20,000 and 25,000 trips per year since 1986, despite a small decline in 1996. After a low period in the late-1980's to mid-1990's, handline trips rose slightly above the long-term average. Baitboat activity remained below the long-term average, although there are indications that it may be experiencing a small revival recently after a long decline.

Figure 23. Commercial trolling catch per trip -- mahimahi, wahoo and blue marlin

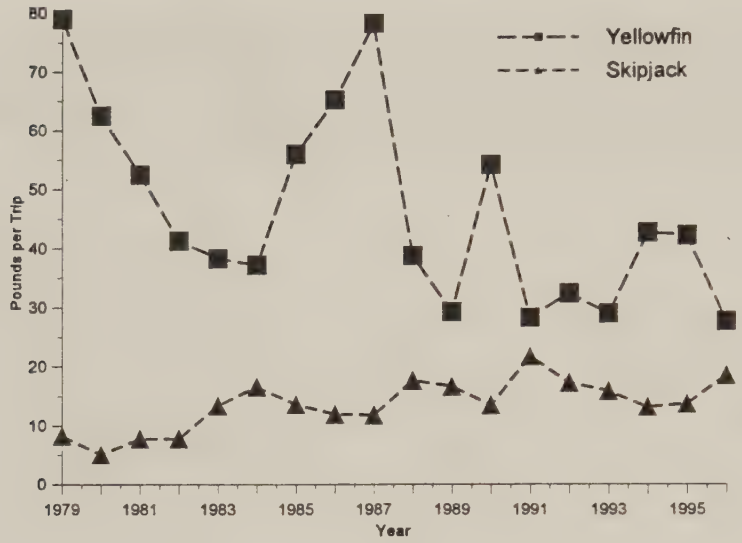


Year	Mahimahi	Ono (Wahoo)	Blue Marlin
1979	13.0	16.3	39.9
1980	14.2	17.3	32.0
1981	14.6	18.0	37.9
1982	15.8	15.1	40.8
1983	14.7	16.3	23.8
1984	14.3	16.1	22.7
1985	21.3	18.8	20.3
1986	17.7	18.8	22.9
1987	24.7	13.8	23.7
1988	13.8	15.1	30.1
1989	19.8	15.6	37.7
1990	24.0	13.2	30.9
1991	31.5	15.4	32.5
1992	23.4	13.7	28.0
1993	21.6	14.5	31.8
1994	24.9	11.7	29.7
1995	18.1	18.7	29.1
1996	**18.6**	**14.8**	**37.2**
Average	19.2	15.7	30.6
Standard Deviation	5.1	2.0	6.3

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: The troll catch rates for non-tuna species were somewhat variable. The catch rate for blue marlin increased to the highest level since 1989 and above the long-term average. The mahimahi catch rate increased slightly but remained below the 1990-1994 catch rates. The wahoo catch rate declined but remained near the long-term average.

Figure 23a. Commercial trolling catch per trip -- yellowfin & skipjack tuna

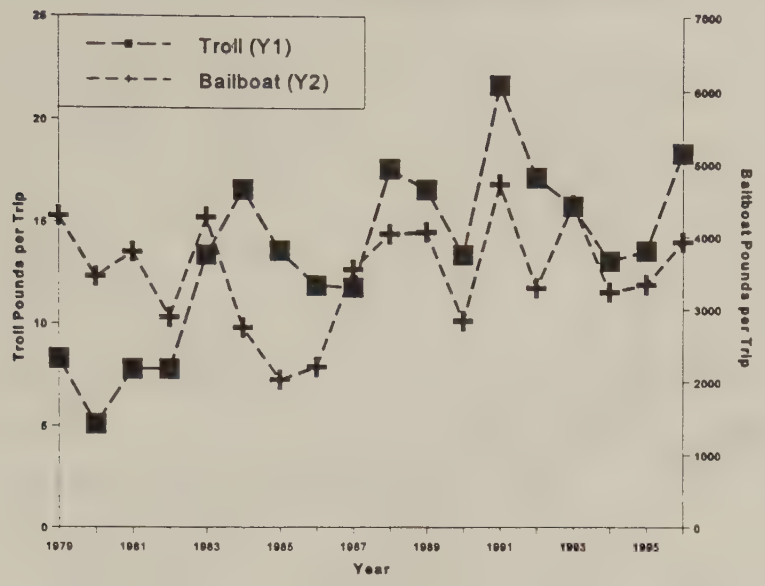


Year	Pounds Caught per Yellowfin	Skipjack
1979	79.0	8.3
1980	62.5	5.1
1981	52.5	7.8
1982	41.3	7.8
1983	38.3	13.4
1984	37.2	16.6
1985	55.9	13.6
1986	65.1	11.9
1987	78.1	11.8
1988	38.7	17.6
1989	29.2	16.6
1990	53.9	13.4
1991	28.2	21.7
1992	32.3	17.2
1993	28.9	15.8
1994	42.4	13.1
1995	41.9	13.6
1996	**27.5**	**18.4**
Average	46.3	13.5
Standard Deviation	16.0	4.2

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: Troll yellowfin tuna catch rate declined to a record low, although remaining highly variable. Catch rates similar to 1996 also occurred in 1989, 1991, and 1993. The skipjack catch rate, in contrast, was second only to the record high in 1991 and above the long-term average.

Figure 24. Baitboat & commercial trolling catch per trip -- skipjack tuna

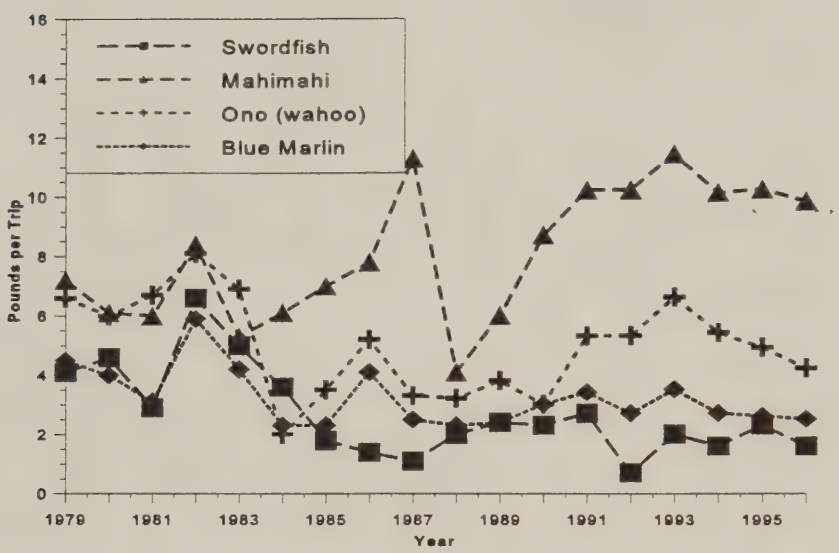


Year	Pounds Skipjack Caught per Trip	
	Trolling	Baitboat
1979	8.3	4,278
1980	5.1	3,447
1981	7.8	3,786
1982	7.8	2,892
1983	13.4	2,468
1984	16.6	2,748
1985	13.6	2,031
1986	11.9	2,206
1987	11.8	3,548
1988	17.6	4,036
1989	16.6	4,061
1990	13.4	2,840
1991	21.7	4,722
1992	17.2	3,297
1993	15.8	4,447
1994	13.1	3,240
1995	13.6	3,341
1996	**18.4**	**3,928**
Average	13.5	3,406
Standard Deviation	4.3	771

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: This figure shows the close correspondence of baitboat and trolling catch rates for skipjack once the level of cannery catch declined substantially, beginning in the mid-1980s. The baitboat catch rate for 1996 is well above the long-term average, but below the record peak of 1991.

Figure 25. Combined commercial handline catch per trip -- swordfish, mahimahi, ono (wahoo), & blue marlin

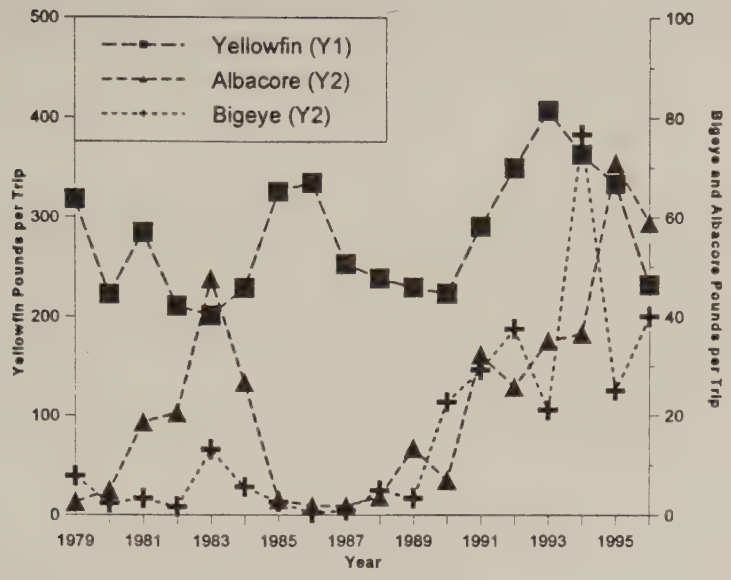


Year	Swordfish	Mahimahi	Wahoo	Marlin
1979	4.1	7.2	6.6	4.5
1980	4.6	6.1	6.0	4.0
1981	2.9	6.0	6.7	3.1
1982	6.6	8.4	8.1	5.9
1983	5.0	5.3	6.9	4.2
1984	3.6	6.1	2.0	2.3
1985	1.8	7.0	3.5	2.3
1986	1.4	7.8	5.2	4.1
1987	1.1	11.3	3.3	2.5
1988	2.0	4.1	3.2	2.3
1989	2.4	6.0	3.8	2.4
1990	2.3	8.7	3.0	3.0
1991	2.7	10.2	5.3	3.4
1992	0.7	10.2	5.3	2.7
1993	2.0	11.4	6.6	3.5
1994	1.6	10.1	5.4	2.7
1995	2.3	10.2	4.9	2.6
1996	**1.6**	**9.8**	**4.2**	**2.5**
Average	2.7	8.1	5.0	3.2
Standard Deviation	1.5	2.2	1.6	1.0

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: Catch rates in the handline fishery remained within their long-term averages. Non-tuna species do not form a major component of the handline fishery landings.

Figure 26. Combined commercial handline catch per trip -- yellowfin, albacore and bigeye tunas



Year	Yellowfin	Albacore	Bigeye
1979	318	3	8
1980	222	5	2
1981	285	19	3
1982	211	21	2
1983	201	48	13
1984	229	27	6
1985	326	3	3
1986	335	2	0
1987	253	2	1
1988	238	4	5
1989	229	13	3
1990	223	7	23
1991	291	32	29
1992	350	26	38
1993	408	35	21
1994	364	37	77
1995	334	71	25
1996	**232**	**59**	**40**
Average	280	23	17
Standard Deviation	62	21	20

Data: Data compiled from HDAR commercial catch report using unique license number-date combinations for species caught > 0 (i.e., does not include zero catch trips).

Interpretation: The catch rates for albacore and bigeye were above the long-term average, despite the drop in albacore catch rate. Bigeye tuna catch rates may indicate differences in species identification. Yellowfin catch rates were below their recent levels and almost below the long-term average.

Appendix 4

Commonwealth of the Northern Mariana Islands

Introduction

The Northern Mariana Islands pelagic fishery occurs primarily around the islands of Saipan, Tinian, Rota and Aguijan. The fishery is characterized using data in the Commercial Purchase Data Base. The collection system for the data is dependent upon first-level purchasers of local fresh fish to accurately record all fish purchases by species categories on specially designed invoices. Staff from the Department of Lands and Natural Resources, Division of Fish and Wildlife (DFW) routinely distribute and collect invoice books from 80 participating local fish purchasers on Saipan. Purchasers include practically all fish markets, stores, restaurants, hotels and roadside vendors ("fish-mobiles").

Data collection that commenced on Rota during March 1993 and on Tinian in August of the same year is no longer being collected and no data from these islands are included in this years report.

Although the Saipan data collection system has been in operation since the mid-1970s, only data collected since 1983 are considered accurate enough to be used. Data quality, with respect to accuracy of landings and species identification on the invoice has improved significantly. The most complete data were obtained from larger fish vendors, so general landings trends, while underestimated, are believed to be relatively accurate.

This database lacks information concerning fishing method, location and effort because previous data generated from Creel Survey are believed to be unreliable. Estimates of total landings and CPUE's have yet to be generated.

To fish commercially within the NMI's exclusive economic zone (EEZ), commercial vessels over five net tons must have a Commercial Fishing License issued annually and jointly by the Department of Commerce and the Department of Lands and Natural Resources. Depending on the information supplied in the application package, the DFW may impose certain fishing restrictions in the form of license conditions. Although commercial boats under five net tons are not required to have a license to fish, all fishing boats are registered with the Department of Public Safety(DPS).

Summary

Trolling is the primary fishing method utilized in the pelagic fishery. The pelagic fishing fleet, other than charter boats, consists primarily of vessels less than 24 ft in length which usually have a limited 20-mile travel radius from Saipan. In 1996, about 74% of all registered boats participated in some form of fishing activity. One hundred and one vessels were identified as being involved in full-time

commercial fishing and 62 vessels were classified as part-time. Subsistence fishing and/or recreational usage included 342 vessels.

In 1996, 30 vessels were registered with the Boating Safety Office as charter vessels, although only 8 vessels conducted full-time charter fishing operations. The remaining 22 charter vessels are associated with part-time fishing and the tourist transport industry. Charter vessels generally retain their catches, selling half or more to local markets. While the general magnitude of charter boat sales is unknown, it is questionable whether the local market can absorb these catches without impacting commercial fishermen. The logbook system used in 1993 was not used in 1996.

The primary marketable target species for the pelagic fleet is skipjack tuna. Yellowfin and mahimahi are also becoming marketable species. During their seasonal runs, these fish are usually found close to shore and provide easy targets for the local fishermen. In addition to the economic advantages of being near shore and their relative ease of capture, these species are widely accepted by all ethnic groups. This has kept market demand fairly high due to the continuing immigrant population growth on Saipan (about half of the population on Saipan is non-native).

The use of larger vessels (>50 ft) for pelagic fishing remains limited. Four commercial fishing licenses were issued in 1996, four in 1995, four in 1994, two each in 1993 and 1992, and none in 1991. In 1996 only one licensed vessel fished the full 12 months. These four vessels primarily targeted bottom fish and only landed pelagics incidentally.

Recommendations

1) To request from WPRFMC for its assistance in providing the CNMI with some expertise (training) in the area of offshore creel census, both on data collection and analyzing.

2) To assist the CNMI in evaluating and salvaging its prior years offshore creel data collection as recommended by Mr. Dave C. Hamm of the Honolulu Laboratory. We are hopeful that the data collected in the past are adequate and useful for analyses.

3) A careful review and comparison of length frequencies and regional landings should be conducted to obtain general biological characteristics from the fishery.

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Table 1. NMI 1996 commercial pelagic landings, revenues and price

Species	Landings (lb)	Revenue ($)	Ave. Price ($/lb)
Misc. tunas	2,558	4,608	1.80
Skipjack tuna	132,155	243,697	1.84
Yellowfin tuna	30,410	62,967	2.07
Subtotal Above Tunas	**165,123**	**311,272**	**1.89**
Dogtooth tuna	10,519	22,694	2.07
Mahimahi	28,524	54,439	1.91
Marlin	6,874	13,138	1.91
Sailfish	545	1,089	2.00
Wahoo	8,626	20,086	2.33
Subtotal Other PPMUS	**55,088**	**111,446**	**2.02**
Troll fish	3,633	6,107	1.68
Barracuda	234	433	1.85
Rainbow runner	885	2,303	2.60
Subtotal Misc.	**4,752**	**8,843**	**1.86**
All Pelagics	**224,963**	**431,561**	**2.02**

Interpretation: Skipjack landings increased by 20% or over 26,000 pounds in 1996, comprising about fifty nine percent (59%) of the (commercially receipted) industry's pelagic catch. Mahimahi and yellowfin tuna were still ranked second and third in total landings during 1996, increasing to 13% and 14% of the total catch respectively. Schools of mahimahi, like skipjack tuna, are easily caught in near shore waters. Mahimahi are highly seasonal with peak catch rates usually from February through April. Yellowfin season usually runs from April to September. Overall pelagic catch increased slightly over 64,000 pounds or 29% in 1996. The sudden increase in all areas of landings and revenues in this report might be partially due to improve data collection and effort.

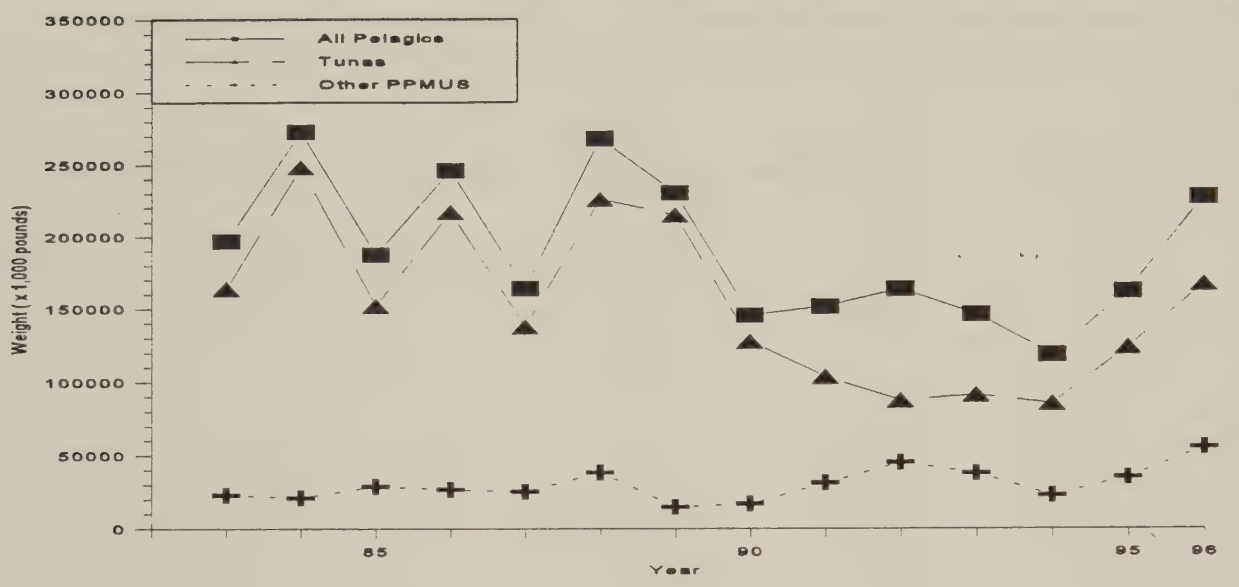
The highest average price of identified pelagic species was $2.57/lb for Rainbow Runner, which is up from the 1995 high of $2.01/lb. The lowest priced species remained marlin at $1.67/lb, but this increased by 7% from 1995's $1.55/lb. In 1996, dogtooth and wahoo surpassed yellowfin tuna and mahimahi in average price. The average price per pound for skipjack tuna, the species with the greatest landings, increased by 4% from $1.77/lb in 1995 to $1.84/lb in 1996. The market share of total pelagic revenues by combining yellowfin tuna and mahimahi increased from $66,133 or 23% in 1995, to $117,406 or 27% in 1996. Skipjack revenue increased from $186,327 or 66% in 1995, to $243,697 or 56% of the total pelagic revenue in 1996.

Blue marlin, which again brought the lowest average price in 1996, is taken primarily by charter boat fishers. The catch of blue marlin increased from 5,295 pounds in 1995 to 6,874 pounds or by 23% in 1996. Other recreational fishers also take it during scheduled fishing tournaments. Although not generally regarded as a high quality food fish, marlin sashimi is sold in local restaurants and hotels.

It is also being served in public institutions. The low ex-vessel price may be partly related to the manner in which the fish is kept prior to sale and the bulky size. These fish are generally not iced when caught and therefore are usually of lower quality at the time of sale. Fishers usually wish to sell the whole fish to avoid cleaning and repackaging the fish into smaller units for sale to restaurants.

Source and Calculation: Annual summaries for each species from the Commercial Purchase Data Base invoices.

Figure 1. NMI annual commercial landings: all pelagics, tuna and PPMUS

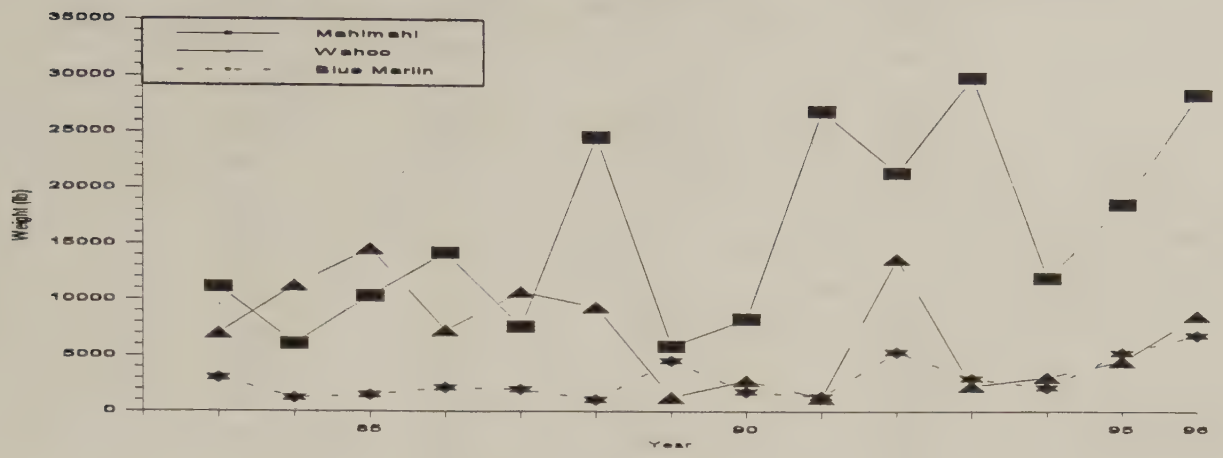


Interpretation: Total weight of pelagics landed in 1996 surpassed 1995 levels. Recorded landings of tunas increased by 26% or slightly over 42,000 pounds from 122,616 pounds in 1995 to 165,122 pounds in 1996. Although this was a sharp increase compared to the previous six years average of 102,497 pounds, it still falls well short of the 1983 - 1990 average of 185,685 pounds. Catch in the 'Other PPMUS' category increased by 37% which is an all time high.

Source and Calculation: All pelagics, tuna and other PPMUS landings were summed from the Commercial Purchase Data Base.

	Total Landings (lb)		
Year	**All Pelagics**	**Tunas**	**Other PPMUS**
1983	196,788	163,754	23,081
1984	272,909	248,339	21,223
1985	187,378	151,882	29,105
1986	245,967	217,023	26,800
1987	164,055	137,566	25,467
1988	267,619	225,498	38,368
1989	229,427	214,249	14,650
1990	144,862	127,172	16,893
1991	150,915	103,078	31,300
1992	162,691	86,931	45,061
1993	145,115	90,584	37,628
1994	117,668	84598	22701
1995	160,540	122,616	34,863
1996	**224,962**	**165,122**	**55,088**
Average	190,778	152,744	30,159
Standard Deviation	49,576	55,275	11,186

Figure 2. NMI annual commercial landings: mahimahi, wahoo, and marlin



Interpretation: Mahimahi landings increased 35% from 18,657 pounds in 1995 to 28,524 pounds in 1996, though still lower than 1993 landing of 30,036 pounds. It is noteworthy that the NMI and Guam mahimahi catches have fluctuated similarly since 1987, which may indicate a strong biological influence in local landing patterns.

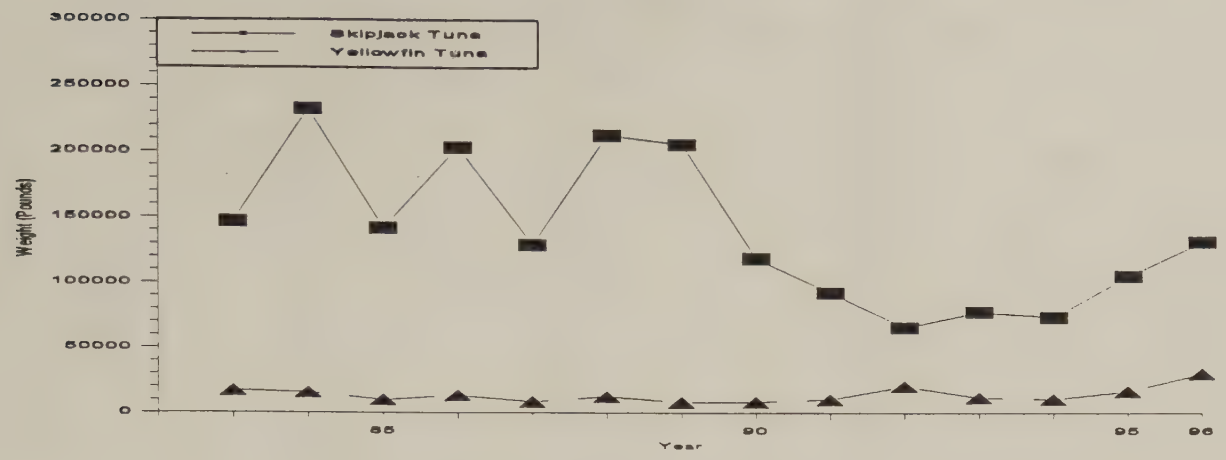
From 1983 to 1988, wahoo landings were somewhat consistent and did not fall below 7,000 lb, but in 1989 landings notably declined by 86% and remained at depressed levels until the dramatic increase in landings during 1992. Following the near-record 1992 landings, the 1993 wahoo landings again decreased by 84%, falling below the mean. Wahoo landings in 1996 increased by 4,071 more pounds or 47% over the 1995 landings. A partial explanation for this increase may be due to wahoo being caught incidently in the Northern Islands' bottom fishing activities.

The 6,872 pounds in blue marlin landing is the highest recording to date. This is a 23% increase in landings over the previous year. It is interesting to note that the time series in the above table indicates marlin 'peak' landings every three years, with the 1986 'peak' showing the smallest increase at 42% over the previous year with the 1989 'peak' showing the highest increase at 335%.

Source and Calculation: The annual commercial landings of the three major PPMUS species (mahimahi, wahoo and blue marlin) were summed directly from the Commercial Purchase Data Base.

Year	Total Commercial Landings (lb)		
	Mahimahi	Wahoo	Blue Marlin
1983	11,151	7,008	3,030
1984	6,091	11,270	1,235
1983	10,364	14,601	1,488
1986	14,237	7,250	2,123
1987	7,602	10,723	1,968
1988	24,639	9,358	1,047
1989	5,856	1,257	4,563
1990	8,306	2,770	1,748
1991	27,005	1,217	1,320
1992	21,462	13,738	5,345
1993	30,036	2,257	2,950
1994	11,993	3,090	2,108
1995	18,657	4,555	5,295
1996	**28,524**	**8,626**	**6,874**
Average	16,137	6,980	2,935
Standard Deviation	8,733	4,571	1,848

Figure 3. NMI annual commercial landings: skipjack and yellowfin tuna



Interpretation: Historically, skipjack landings exhibited an alternating two-year cycle from 1983 to 1988 and comprised over 73% by weight of the total pelagic landings each year from 1983 to 1989 (data taken from Table 1 and Fig. 3). Skipjack tuna landings declined after that, reaching record lows in 1990, 1991 and 1992. In 1993 and 1994 skipjack landings showed signs of stabilizing at about half of their respective eleven and twelve year means, while the nearly 32,000 pound increase in 1995 landings attained 61% of the 1983-1990 average of 174,020 pounds. In comparison to 1995 skipjack landings, 1996 landings increased by 20% or slightly over 26,000 pounds. This slight increase is partially due to improved data collection.

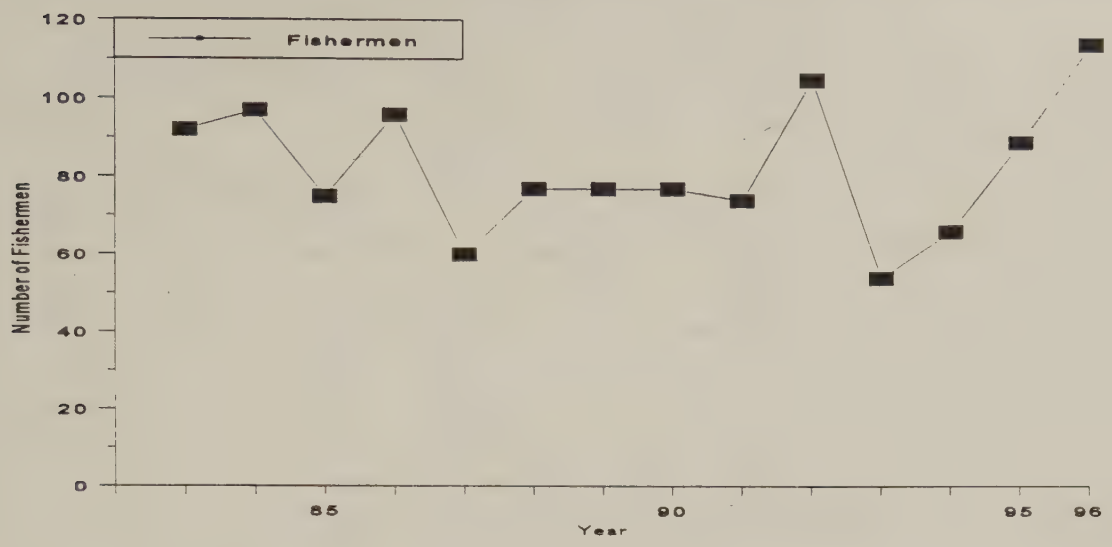
Schools of skipjack tuna have historically been ubiquitous in near shore waters, thus providing an opportunity to catch numerous fish with a minimum of travel time and fuel costs. Skipjack are readily consumed by the local populace, primarily as sashimi.

Although more highly prized than skipjack, yellowfin tuna are not as common, and therefore not taken as often. The average fish size tends to be smaller when compared with yellowfin tuna from other geographic areas. The 1995 landings increased by 37% over 1994, surpassing the 1983-1994 average of 12,246 pounds. Remarkably, the 1996 yellowfin tuna landings increased by 45% or 13,586 pounds from the previous year. This is the highest landing ever recorded, surpassing all previous years. The demand for yellowfin tuna has increased significantly due to a "new" and larger market, namely the Korean restaurants and community. This demand has also caused the price of yellowfin tuna to increase as seen in Figure 6.

Source and Calculation: Landings were summed directly from the Commercial Purchase Data Base.

	Total Commercial Landings (lb)	
Year	**Skipjack tuna**	**Yellowfin tuna**
1983	146,729	17,025
1984	232,675	15,664
1985	141,910	9,973
1986	203,490	13,533
1987	129,203	8,363
1988	213,198	12,300
1989	206,162	8,087
1990	118,798	8,374
1991	92,642	10,433
1992	65,982	20,672
1993	77,832	11,919
1994	73,769	10,600
1995	105,423	16,824
1996	**132,155**	**30,410**
Average	138,569	13,870
Standard Deviation	55,589	6,075

Figure 4. Number of NMI fishermen (boats) making commercial pelagic landings



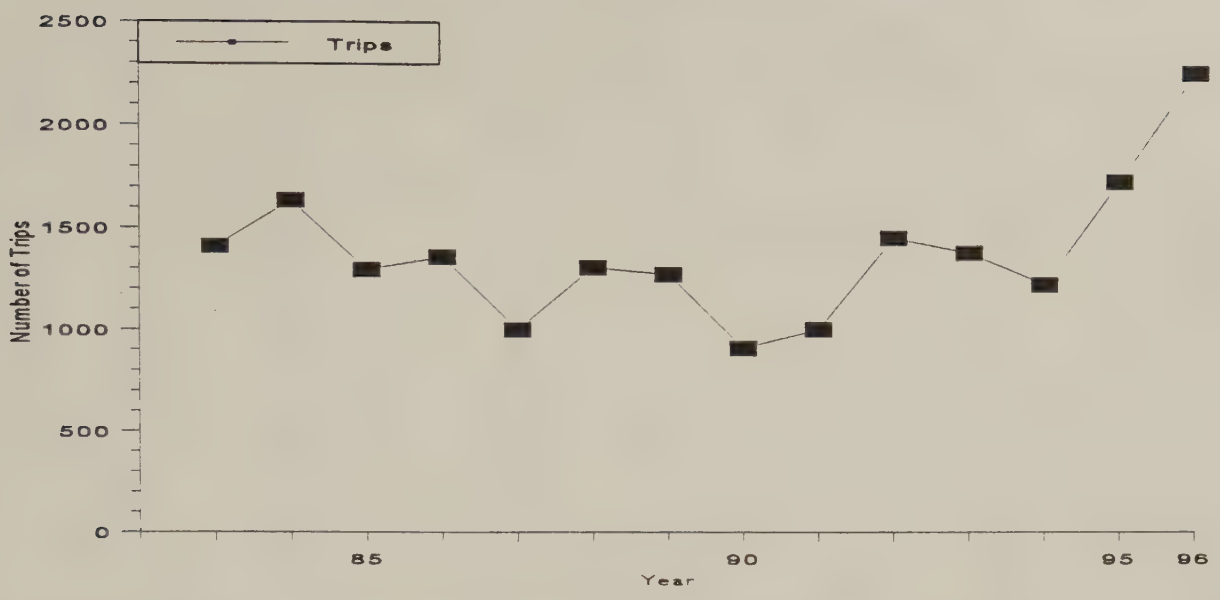
Interpretation: The number of fishers (boats) making commercial pelagic landings was relatively constant from 1988-91 compared to earlier years, but a record high number was recorded for 1992 (30% from 1991). Some of the increase in 1992 was attributable to the influx of new fishing boats as a result of money obtained by leasing property. In addition, it was discovered that some fishers were using several different boats, thus artificially inflating the total number of boats making pelagic landings.

Many of 1992's "new" fishers, with their new boats, are believed to have left the fishery during 1993. The number of fishers in 1995 increased by about 26% from 1994. And the number of fishers in 1996 increased by about 22% from 1995. It has been suggested that the 1994 increase may have been due to the re-entry of repaired and refurbished boats from the 1992 fleet. It is possible that this activity has also played a role in the 1995 and 1996 increase. As suggested in 1994, an entry/exit pattern of fishermen and boats within the fishery should be completed for the past five years to explore this possibility.

Source and Calculation: Each invoice from the Commercial Purchase Data Base records the fisherman's name from whom the fish were purchased. The number of fishermen who sold any pelagic species was calculated directly from the data invoices.

Year	No. fishermen landing any pelagic species
1983	92
1984	97
1985	75
1986	96
1987	60
1988	77
1989	77
1990	77
1991	74
1992	105
1993	54
1994	66
1995	89
1996	**114**
Average	82
Standard Deviation	17

Figure 5. NMI number of trips catching any pelagic fish

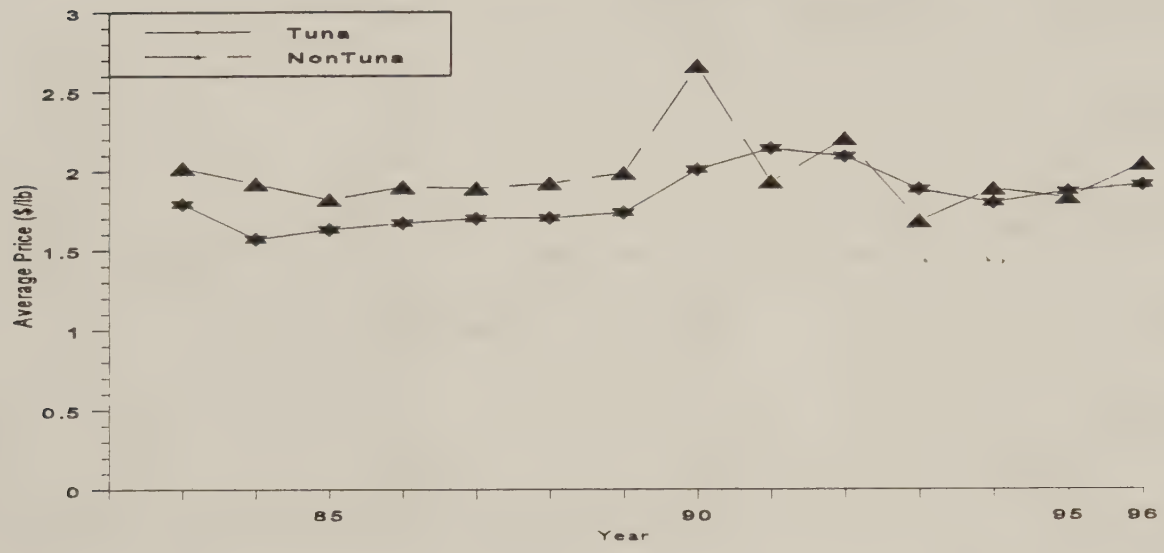


Interpretation: The number of pelagic trips increased to an all time high in 1996, which corresponds well with the tabled data from the previous four graphs which show an increase in landings and number of fishers. It cannot be determined whether or not this sharp increase is actual or due to an increase in invoice supply and data collection effort.

Source and Calculation: The total trips for all pelagic species were summed from the Commercial Purchase Data Base. Trips were calculated based on the assumptions that no fisherman makes more than one trip per day, and that all sales from a single trip are made on a single day.

Year	Number trips
1983	1,408
1984	1,634
1985	1,293
1986	1,356
1987	999
1988	1,306
1989	1,272
1990	910
1991	1,002
1992	1,451
1993	1,378
1994	1,221
1995	1,727
1996	**2,254**
Average	1,372
Standard Deviation	341

Figure 6. NMI average inflation-adjusted price of tunas and other PPMUS



Interpretation: The inflation-adjusted average price of tuna was stable from 1983 until 1989, when an obvious rise was observed. The 1990-92 rise in price corresponds with the notable decrease in skipjack tuna landings (Fig. 3) during the same period of time. In 1994 commercially receipted tunas commanded a lower price than in recent years. However, considering the inflation-adjusted prices from 1983 to 1994, it would appear that tuna prices have, on the whole, kept pace with inflation. The real decline in the last two years is likely a symptom of the effects of the NMI's recent economic downturn, as well as an increase in tuna imports.

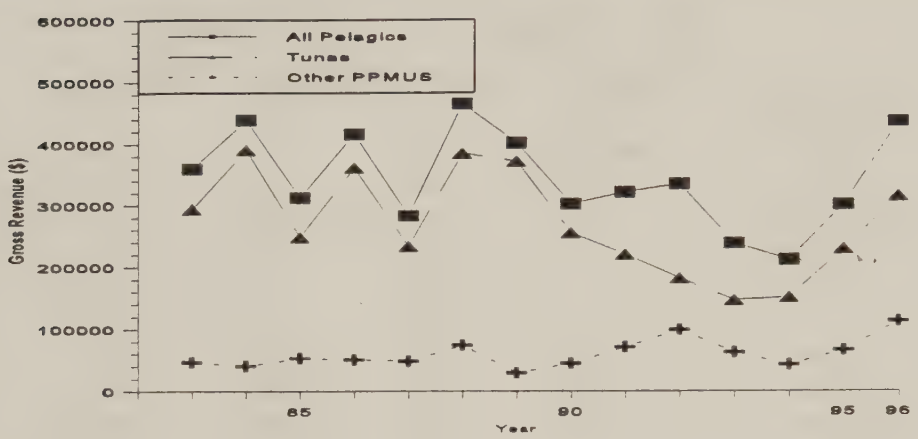
In 1995 the normalization of the relative value of tuna to the "Other PPMUS" category continued. The data also suggest that fish in the "Other PPMUS" category did not kept up with inflation in 1994 and 1995. The long-term average ($1.99/lb) is lower than the inflation adjusted price in 1983.

In 1996 the inflation-adjusted average price per pound increased by 2% or .04 cents from the previous year. Although the landings of skipjack tuna increased by 20% as shown in Figure 3, the adjusted average price also increased caused by a higher demand for fresh skipjack tuna and other pelagic species, and by an increase in a "new" and larger market, namely the Korean restaurants and community. The influx of Korean tourists has been beneficial to the CNMI fisheries. Another factor in 1996 that caused the slight increase in price of skipjack tuna and other pelagic species is due to the increase cost of fuel. The price of gasoline in the CNMI is around $1.89 and diesel sells for about $1.85 per gallon.

Source and Calculation: The unadjusted average price is calculated by dividing the total revenues generated by the total weight sold. The inflation adjustment is made using the 1996 NMI Consumer Price Index (CPI) as the basis by which calculations of previous years' prices are made.

	Average Price ($/lb)			
	Tunas		Other PPMUS	
Year	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	0.99	1.79	1.12	2.02
1984	0.95	1.57	1.15	1.92
1985	1.02	1.63	1.14	1.82
1986	1.07	1.67	1.22	1.90
1987	1.14	1.70	1.27	1.89
1988	1.20	1.70	1.35	1.92
1989	1.29	1.73	1.48	1.98
1990	1.56	2.00	2.07	2.65
1991	1.80	2.13	1.92	2.26
1992	1.91	2.08	2.01	2.19
1993	1.78	1.87	1.59	1.67
1994	1.75	1.84	1.83	1.92
1995	1.80	1.85	1.81	1.87
1996	**1.89**	**1.89**	**2.02**	**2.02**
Average	1.40	1.82	1.57	2.00
Standard Deviation	0.38	0.17	0.36	0.24

Figure 7. NMI annual commercial adjusted revenues



Interpretation: The erratic fluctuations of the inflation-adjusted revenues for Tunas and for All Pelagics prior to 1990 is most likely due to the annual variations in skipjack tuna landings (see Fig. 3) which completely dominate the tuna category and, therefore, the All Pelagics category. The divergence of All Pelagics and Tunas in 1991 and 1992, which normally correspond, is corrected between 1993 and the end of 1996.

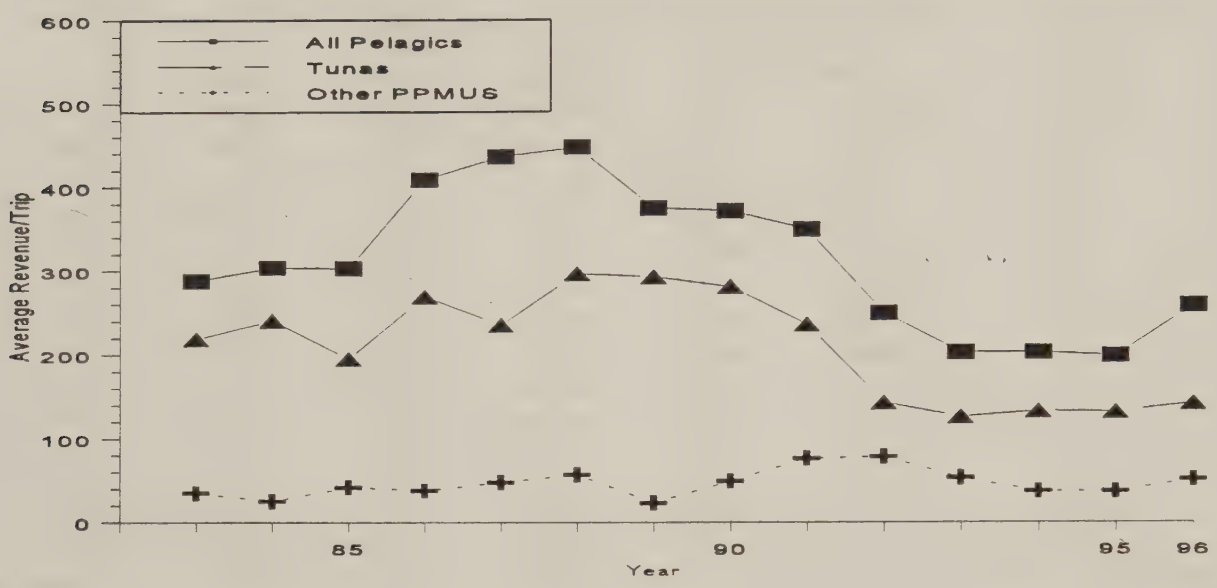
The tunas' inflation-adjusted revenues increased 27% in 1996, lower than the 1989 total. "Other PPMUS" inflation-adjusted revenues increased by 42% from the 1995 level. This increase is supported by the demand for fresh skipjack tuna sashimi as well as other pelagic species by the "new" market.

Source and Calculation: Annual revenue in dollars was summed separately for all pelagic fish, tunas and other PPMUS. Inflation-adjusted revenues were calculated using the Consumer Price Index, with 1996 as a base by which previous years' nominal prices are adjusted.

Revenues ($)

	All Pelagics		Tunas		Other PPMUS	
Year	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
1983	198,710	359,665	162,240	293,654	25,770	46,644
1984	264,203	438,577	235,262	390,535	24,503	40,675
1985	195,372	312,595	155,171	248,274	33,162	53,059
1986	267,013	416,540	231,745	361,522	32,631	50,904
1987	190,150	283,324	156,634	233,385	32,333	48,176
1988	327,260	464,709	270,679	384,364	51,950	73,769
1989	299,142	400,850	276,671	370,739	21,635	28,991
1990	235,520	301,466	198,775	254,432	34,968	44,759
1991	271,030	319,815	185,662	219,081	60,031	70,837
1992	305,927	333,460	166,235	181,196	90,627	98,783
1993	249,136	237,509	161,100	146,054	60,001	62,019
1994	207,124	210,201	147,940	150,389	41,548	41,822
1995	289,740	298,432	220,633	227,252	63,264	65,162
1996	**431,560**	**431,560**	**311,271**	**311,271**	**111,445**	**111,445**
Average	266,563	343,479	205,716	269,439	48,848	59,789
Standard Deviation	64,685	77,663	52,887	84,317	26,347	22,929

Figure 8. NMI annual commercial adjusted revenues for PPMUS trips only



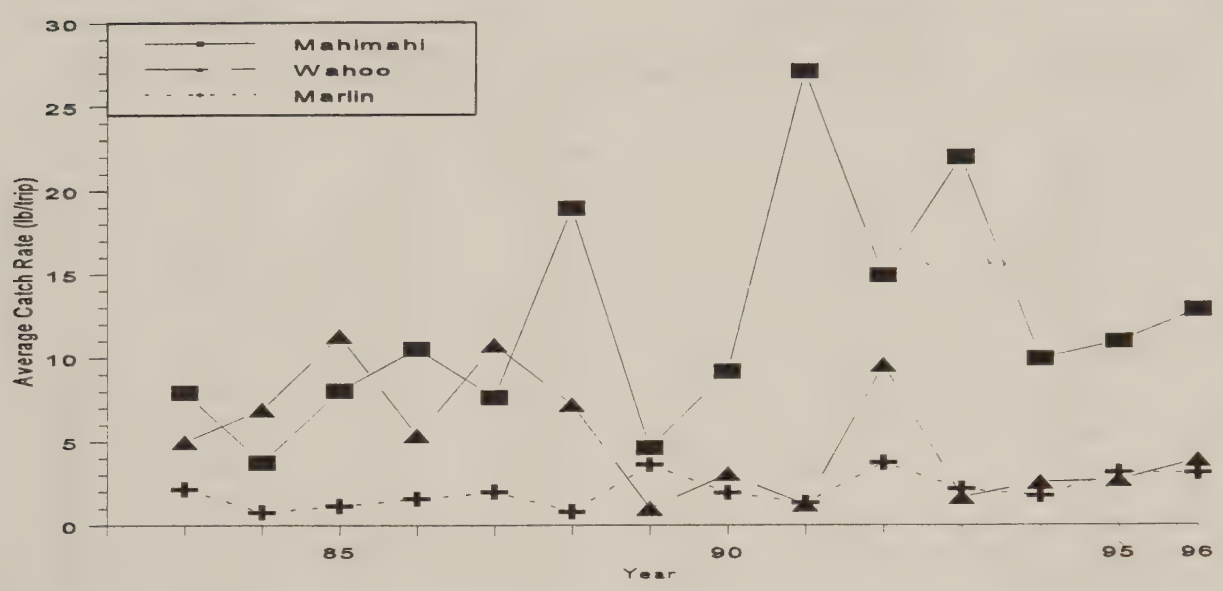
Interpretation: The inflation-adjusted revenues per trip for "All Pelagic Species" and "Tunas" indicates an increase by 20% and 5% consecutively in 1996. The current year inflation-adjusted values for all categories are still well below their respective 13-year means.

Inflation-adjusted revenue per trip for "Other PPMUS" remained constant from 1994. The reason for the initial decrease in 1993-94 is unknown. However in 1996 the inflation-adjusted per trip increased by 24%.

Source and Calculation: Values were obtained by selecting, from the Commercial Purchase Data Base, all trips which landed at least one PPMUS, and then calculating a) the average revenue of all species, b) the average revenue of other PPMUS only, and c) the average revenue of tuna only. Inflation-adjusted revenues were derived from the NMI Consumer Price Index (CPI) which used 1996 as a base.

	Revenues per PPMUS Trip ($)					
	All Pelagic Species		Tunas		Other PPMUS	
Year	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	159	288	121	219	19	35
1984	183	304	145	241	15	25
1985	189	303	122	195	26	42
1986	262	409	172	269	24	38
1987	292	436	157	235	32	48
1988	315	447	209	296	40	57
1989	279	374	218	292	17	23
1990	289	370	219	280	39	49
1991	295	348	199	235	64	76
1992	228	248	130	142	71	78
1993	192	201	125	125	47	53
1994	197	201	129	132	36	37
1995	198	204	130	134	37	39
1996	**256**	**256**	**141**	**141**	**51**	**51**
Average	238	314	158	210	37	47
Standard Deviation	51	86	38	64	17	16

Figure 9. NMI trolling catch rate of mahimahi, wahoo and marlin



Interpretation: The 1996 mahimahi catch rate increased by 15% over 1995, but was still less than half of the 1993 rate and under the thirteen year mean. This could be due in part to the loss of the FADs, which attract the species, making it more accessible. It may also be biological-- note that the trolling catch rates of Guam and the NMI have fluctuated similarly over the last twelve years.

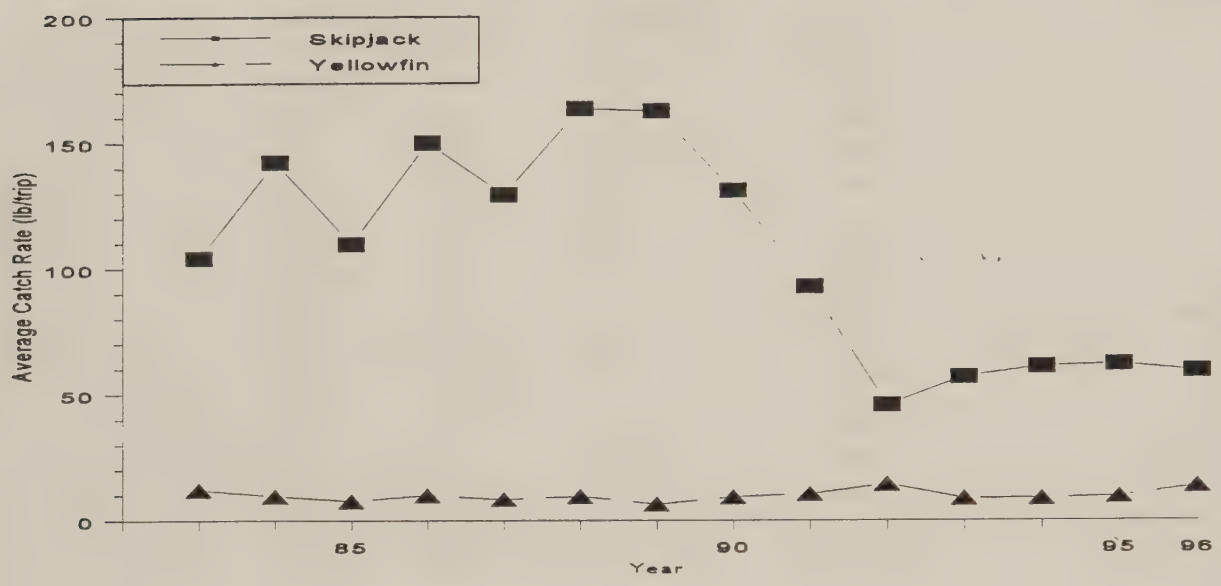
Prior to the 1989 record low, wahoo catch rates rivaled mahimahi. Wahoo catch rates have generally never regained those historical levels. The 1996 catch rate increased by 31% from 1995, but was little more than half the twelve year mean.

Marlin catch rates, relative to mahimahi and wahoo, are normally fairly low (record high catch rate of 1.7 kg/trip in 1992). The 1996 catch rate decreased by less than 1%.

Source and Calculation: Annual catch rates for selected species were obtained by calculating the average weight per trip for each year. Trips were assumed to be one day in length and each commercial invoice assumed to represent one trip.

Year	Trolling Catch Rate (lb/trip)		
	Mahimahi	Wahoo	Marlin
1983	7.92	4.98	2.15
1984	3.73	6.90	0.76
1985	8.02	11.29	1.15
1986	10.50	5.35	1.57
1987	7.61	10.73	1.97
1988	18.87	7.17	0.80
1989	4.60	0.99	3.59
1990	9.13	3.04	1.92
1991	26.95	1.21	1.32
1992	14.79	9.47	3.68
1993	21.80	1.64	2.14
1994	9.82	2.53	1.73
1995	10.80	2.64	3.07
1996	**12.65**	**3.83**	**3.05**
Average	11.94	5.13	2.06
Standard Deviation	6.60	3.50	0.96

Figure 10. NMI trolling catch rates of skipjack and yellowfin tuna



Interpretation: Catch rates for skipjack tuna decreased dramatically commencing in 1990. Although the 1993 through 1996 catch rates show signs of stabilizing, they remain far below their respective means. Skipjack tuna are the preferred species in the troll fishery of the NMI because of their relative ease of capture and local popularity as sashimi. Previous discussions have suggested that non-tuna PPMUS may be increasing in value and a slight shift in target troll fish may be occurring, especially since the skipjack tuna no longer appear to be as abundant.

Catch rates of yellowfin tuna per trip appears to have increased by 28% after dropping for several years. Yellowfin tuna, although more highly prized than skipjack, are not encountered often and are usually taken incidentally while targeting other species.

Source and Calculation: Data were summarized from the Commercial Purchase Data Base, which provides average pounds caught per trip. Annual catch rates for selected species were obtained by calculating the average weight per trip for each year. Trips were assumed to be one day in length and each commercial invoice represents one trip.

	Trolling Catch Rate (lb/trip)	
Year	**Skipjack**	**Yellowfin**
1983	104.21	12.09
1984	142.40	9.59
1985	109.75	7.71
1986	150.07	9.98
1987	129.33	8.37
1988	163.25	9.42
1989	162.08	6.36
1990	130.55	9.20
1991	92.46	10.41
1992	45.47	14.25
1993	56.48	8.65
1994	60.42	8.68
1995	61.04	9.74
1996	**58.63**	**13.49**
Average	104.72	9.85
Standard Deviation	42.49	2.16

Appendix 5

International

The areas administered by the Council are surrounded by large and diverse fisheries targeting pelagic species. This report summarizes information on the 1995 catches of pelagic species reported in the north and equatorial western Pacific by fleets of various nations. The information was assembled from several sources.

- Data on the geographic distribution of catch and effort by the United States purse seine fleet were supplied by the National Marine Fisheries Service Southwest Region from data reported under terms of the United States and Pacific Island multilateral fishing.
- Data on total catches by all fleets operating in South Pacific Commission Statistical Area (Figure 20) were gleaned from the 1995 South Pacific Commission (SPC) Tuna Fishery Yearbook.[1] The SPC yearbook warns "many estimates for 1995 should be considered as preliminary".
- Data on the geographic distribution of catches north of the equator was supplied by the SPC under the terms of a special request from the WPRFMC. These data are aggregated by 5° degree geographic square, gear type and month. The 1995 estimates of total catch should be considered preliminary.
- Documents presented to the June 16 – 20 meetings of the Standing Committee on Tuna and Billfish and the Western Pacific Yellowfin Tuna Research Group held in Nadi, Fiji.

Caveats and general interpretations.

- This report is the first attempt to assemble data from available sources and summarize it in a format suitable for the WPRFMC. There is no general consistency between sources in units of reporting or in geographic conventions, nor is the extent of coverage by fleet and geographic area always clear.
- All data are "second hand", and therefore it is impossible to verify their accuracy. At best, it is possible to state that the tables and figures reported here accurately reflect the data as supplied.
- Much of the data on which this report are based were compiled in mid 1996 and it is likely that estimates of 1995 catch are based on incomplete data.
- In some cases, catch in numbers or "pieces" have been converted to weight by the agency that supplied the data using conversion factors of unknown accuracy. Catches

[1] Lawson, T. (editor) 1996. South Pacific Commission Tuna Fishery Yearbook 1995. Oceanic Fisheries Program, South Pacific Commission, Noumea, New Caledonia. 92 pp. ISSN 1022-4564; ISSBN 982-203-510-1

provided in metric tonnes were converted to thousands of pounds by multiplying by 2.2046.

- The 5° resolution of the catch distribution maps occasionally gives the impression that fishing has occurred within an EEZ when it fact the fishing occurred in the 5° square that contains the boundary of the EEZ.
- In some cases it is ambiguous whether the data geographic stratum referenced by longitude and latitude are aggregated over a square centered on the coordinates or over a square referenced by one of the corners. As a result, some discrepancies in positions of circles may be apparent between maps.
- Longline data from the SPC for 1995 do not contain data from the Hawaii-based fleet.

Status of Stocks.

Two groups of scientists meet annually to review current research and to evaluate the status of tuna stocks in the central and western Pacific. The SPC Standing Committee on Tunas and Billfish (SCTB) has met annually since 1987. The Western Pacific Yellowfin Tuna Research Group (WPYRG) was formed in 1991 and meets in conjunction with the SCTB. Scientists participate in these meetings as individuals rather than as government representatives, and discussions are generally technical rather than political. In recent years, membership in these two groups had converged, and the work of WPYRG had expanded to also consider skipjack and bigeye. Membership in these two groups consists of scientists from pacific island nations, distant water fishing nations (including Indonesia, Japan, Korea, Philippines, Taiwan, United States), the SPC, the Forum Fisheries Agency (FFA), the Inter-American Tropical Tuna Commission (IATTC), the Food and Agricultural Organization of the United Nations (FAO), and the Western Pacific Regional Fishery Management Council.

These two groups last met in Nadi, Fiji in June, 1997. In addition to its normal scientific agenda, the SCTB reorganized itself. In the future, review of SPC Oceanic Fisheries Programme research will no longer be a component of the SCTB terms of reference. The work of the reorganized SCTB will be conducted by various research groups devoted to particular species and topics. Future work of the WPYRG and the South Pacific Albacore Research group (SPAR) will be conducted as SCTB research groups. Additional research groups on skipjack, bigeye, statistics, and by-catch will be formed.

The following summary of the status of stocks of the four principle tuna species is based on material presented at the Nadi meeting.

Skipjack. Two sources of information are used to evaluate skipjack stocks, tagging and catch per unit of effort (CPUE) data at the SPC. The CPUE time series shows no obvious signs that the fisheries have impacted the stocks. Concern was expressed at the meeting that changes in purse seine operations have complicated interpretation of CPUE, but not to the extent that the overall conclusion would be incorrect. Tagging results suggest that current exploitation rates are low to moderate.

Yellowfin. Similar approaches are take to the evaluation of yellowfin stocks, but augmented with analyses by yellowfin research group scientists. The general consensus

of the meeting was that there are no obvious signs of significant impacts on the stock. However, there was concern over decreasing trends in CPUE noted in some segments of the fishery. Of particular concern was a five year continuous decline in the CPUE of large yellowfin in Japanese purse seine catches. Changes in both targeting and fishing grounds over the same period of time confound interpretations of the change in the CPUE. The results from the age- and space- structured assessment model currently under development should improve understanding of yellowfin stock dynamics.

Bigeye. Current stock structure studies indicate that there is little, if any, separation of eastern and western Pacific bigeye stocks, but the longline CPUE for the eastern Pacific is decreasing while that for the western Pacific is stable. Analysis of the eastern Pacific data indicate that catch levels in that region may be nearing full exploitation. Lack of complete information on bigeye mortality and exploitation rates makes conclusions about the status of Pacific bigeye stocks uncertain. The revised structure of the SCTB should help promote further research.

Albacore. The conclusion of the most recent meeting of the South Pacific Albacore Research Group was: "Total catches of South Pacific albacore have been stable over the past several years, although success of the troll fishery in the STCZ has been variable. Longline CPUE has been stable of increasing in recent years, and there is no evidence from these data that the current levels of fishing are adversely affecting the stock. Nor is there any indication that the driftnet catches if the late 1980s and early 1990s have had a significant impact on the stock or on the longline fishery. Analyses of tagging data and a length-based age-structured model provide reasonably consistent estimates of growth and mortality rates, which suggest that albacore are slowly growing and long lived relative to the tropical tunas. The fisheries potential of albacore is there fore more restricted by comparison with these species. The tagging and age-structured models also provide preliminary indication that current exploitation is relatively low, probably less than 10% per year. This provides further evidence that the current level of fishing can be sustained."

The was no discussion of north Pacific albacore.

Billfish

Most billfish are taken incidentally during longline fishing operations targeting tuna. Very few stock assessments have been conducted on Pacific stocks. For many species the most recent Pacific stock assessments were conducted for the Second International Billfish Symposium in Kona, Hawaii in 1988. Many billfish stock "assessments" represent little more than a review of trends in catch and CPUE. While most studies suggest that the stock in question is healthy, there is considerable uncertainty in the quality of data and the methods used to evaluate the trends.

Pacific Blue Marlin. One blue marlin stock assessment presented at the Billfish Symposium fit a generalized production model to longline catch and effort data adjusted to account for measures of the effect of changing to deeper longline gear starting in the mid 1970s. This study used data through 1985, and showed that although the stock

showed signs of being maximally exploited in the 1970s, further increases in fishing effort in subsequent years did not result in the expected decrease in CPUE. This study suggested that blue marlin might not be overfished since there was no trend in CPUE even with increased fishing effort. A study published by the Inter American Tropical Tuna Commission (IATTC) in 1996 using statistics through 1989 also showed that nominal CPUE was without trend. However, the IATTC study also made adjustments to CPUE to account for area-specific relationships between fishing depth and habitat preferences of blue marlin. The adjusted CPUE data showed an increasing trend, but the authors caution that this finding should not be taken as a conclusion regarding the status of the blue marlin stock. The WPRFMC blue marlin workshop in 1994 presented some evidence suggesting that the effective fishing effort for blue marlin is increasing in the 1990s as longline fishing increases by nations less proficient at targeting deep swimming bigeye tuna.

Striped Marlin. Production model analyses for stocks of striped marlin in the North and South Pacific presented at the Billfish Symposium were again generalized production models based on longline data through 1985 corrected for the trend towards deeper fishing in the late 1970s and early 1980s. The model would not adequately fit the North Pacific data but CPUE trends suggested a healthy stock. A better fit was found for the South Pacific data and also suggested a healthy stock.

Broadbill Swordfish. Again, a stock assessment using the generalized production model approach was presented at the Billfish Symposium, this one limited to data through 1980. This study found that the resource was healthy. More recently, the IATTC conducted an assessment of swordfish in the eastern Pacific that was presented to the First International Swordfish Symposium in Ensenada, Mexico in 1994. This study made adjustments to longline CPUE data through 1987 to account for fishing depth and habitat preferences and fit a more sophisticated, delay-difference production model to the catch and effort data. The trend in CPUE was found to be declining, but not to a level as low as that predicted for the maximum sustained level of production. More recent information discussed at the Second International Swordfish Symposium in Kahuku Hawaii also suggested that Pacific swordfish stocks are healthy.

Other Billfishes. The Billfish Symposium studies also suggested that the black marlin stock was healthy based on CPUE trends (again, the data would not fit a production model). No evaluation was possible for spearfish and sailfish; not even a simple consideration of CPUE trends. This was because catches of these two species were lumped in statistics from most Pacific longline fisheries. The U.S. longline fishery distinguishes between these species and attempts are underway to remedy the data problem in other fisheries.

Acknowledgments.

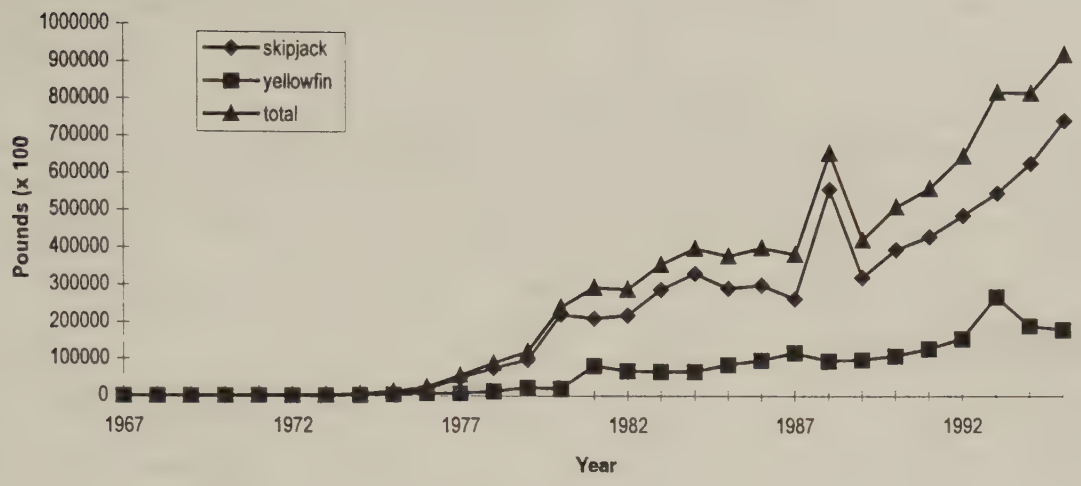
Dr. John Sibert, manager of the Pelagic Fisheries Research Program at the University of Hawaii, coordinated preparation of this report. Dr Chris Boggs of the NMFS Honolulu

Laboratory provided the section on billfish. Mr. Kevin Weng of the University of Hawaii, Department of Oceanography prepared the figures, tables and maps. Mr. Johnoel Ancheta of the PFRP assisted in manipulating the data files. Ms. Dodie Lau of the PFRP revised the maps and assisted in preparation of the report. Dr. A. D. Lewis of the South Pacific Commission and Ms. Hilda Diaz-Soltero, Regional Administrator of NMFS SW Region, graciously satisfied the Council's requests for data. Mr. Tim Lawson of the SPC kindly made the SPC Tuna Fishery Yearbook available on CDROM and assisted with interpretation of the data.

Table 1. Total reported purse seine catch of skipjack and yellowfin tuna 1967-1995 in 1000s of pounds in the SPC Statistical Area.

Year	Bigeye	Skipjack	Yellowfin	Total
1967	0	9	51	60
1968	0	291	480	771
1969	0	168	0	168
1970	0	680	62	742
1971	0	1107	312	1420
1972	24	1188	376	1606
1973	16	1762	238	2033
1974	4	4322	1058	5423
1975	37	9273	3103	12559
1976	335	17970	6177	24563
1977	204	46776	7583	55151
1978	603	74959	12994	88787
1979	787	96641	22050	120338
1980	784	220173	18399	239864
1981	1415	210163	80771	292621
1982	1581	217781	67134	287654
1983	1260	288367	65235	355113
1984	831	331242	66548	398706
1985	1371	291087	84365	376972
1986	1722	300316	97866	400088
1987	2004	263145	117791	383657
1988	722	558906	94956	654969
1989	2278	321129	97980	421523
1990	3174	395431	109906	509206
1991	2718	429387	127892	560090
1992	3169	486779	155462	647165
1993	1930	547901	269312	819663
1994	916	627103	190540	818868
1995	**1199**	**743039**	**179651**	**924107**
Average	1003	223693	64769	289789
Std Deviation	875	197536	68198	258613

Figure 1. Total purse seine catch of skipjack and yellowfin tuna 1967 - 1995 in the SPC Statistical Area.



Data

Data are from the 1995 SPC Yearbook. Fleets included are from Australia, Federated States of Micronesia, Indonesia, Japan, Kiribati, Korea, Mexico, New Zealand, Papua New Guinea, Philippines, Russia, Solomon Islands, Taiwan, United States, and Vanuatu.

Interpretation

The steady increase in purse seine catches that began in the late 1970s continues. Skipjack dominates the western Pacific purse seine catches. Yellowfin catches have not increased substantially since their maximum in 1993 due to changes in targeting by the purse seine fleets.

Figure 2 Distribution of total purse seine skipjack catch in 1995 by 5° geographic square. NB, does not include data from vessels fishing exclusively outside SPC statistical area.

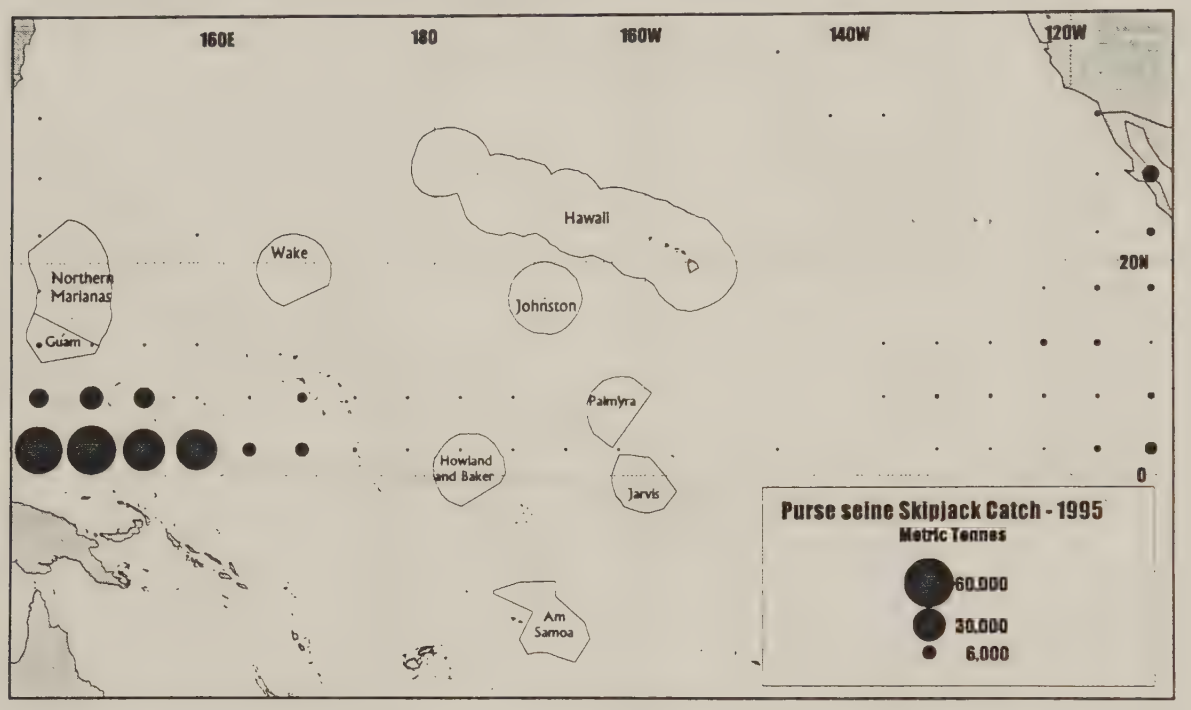
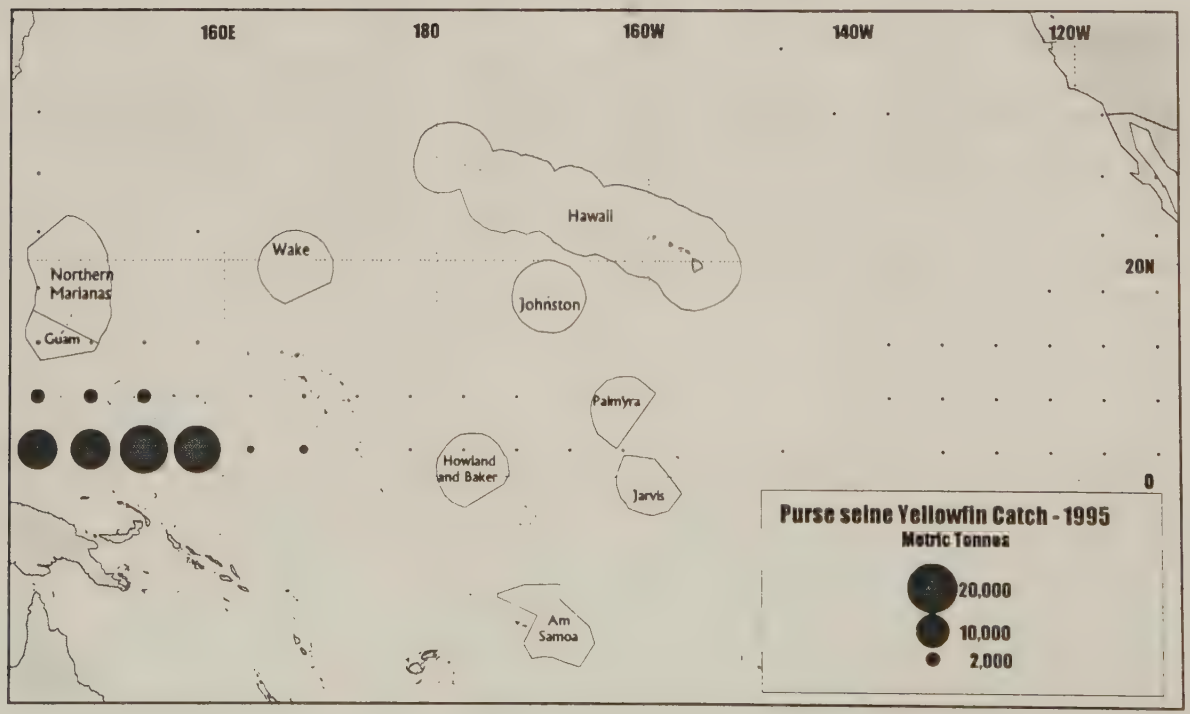


Figure 3. Distribution of total purse seine yellowfin catch in 1995 by 5° geographic square. NB, does not include data from vessels fishing exclusively outside SPC statistical area.



Data

Data were supplied by the SPC under the terms of a special request. Data are aggregated by 5° degree geographic square. Fleets included are from Australia, Federated States of Micronesia, Indonesia, Japan, Kiribati, Korea, Mexico, New Zealand, Papua New Guinea, Philippines, Russia, Solomon Islands, Taiwan, United States, and Vanuatu.

Interpretation

The bulk of purse seine activity occurs in the highly productive fishing grounds in the equatorial western Pacific, principally in the EEZs of Papua New Guinea, Federated States of Micronesia, and Kiribati. The extent of fishing activity in this area depends on the existence of bilateral fishing agreements between the Island States and the various DWFNs.

Figure 4. Distribution of United States purse seine effort in 1995 by 5° geographic square.

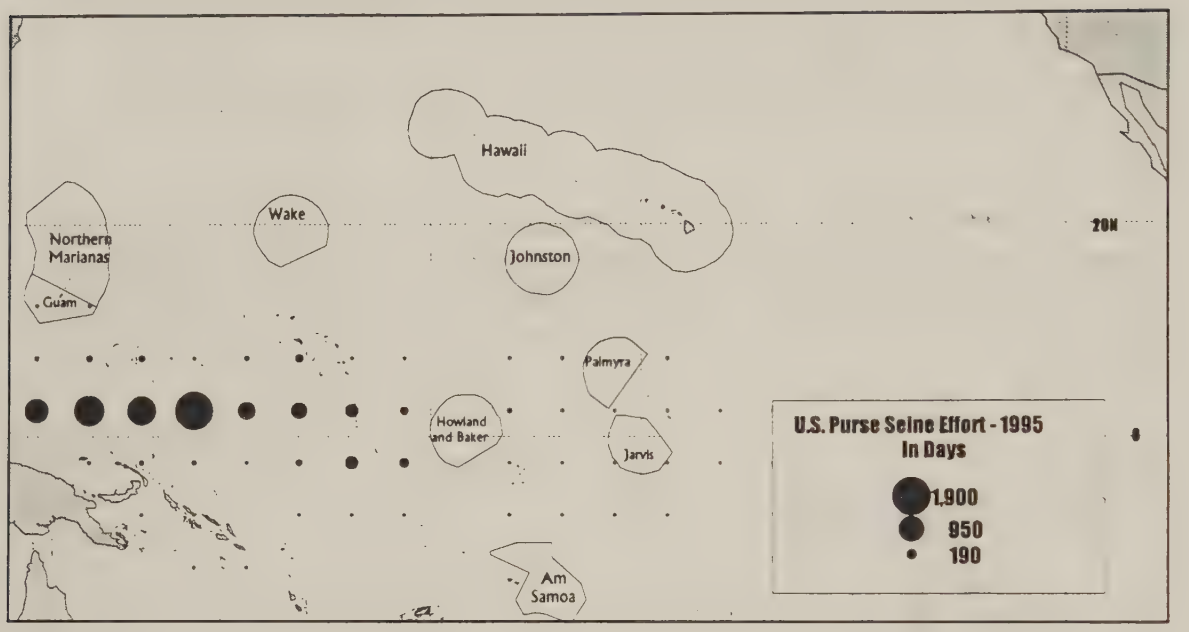


Figure 5. Distribution of United States purse seine catch of skipjack in 1995 by 5° geographic square.

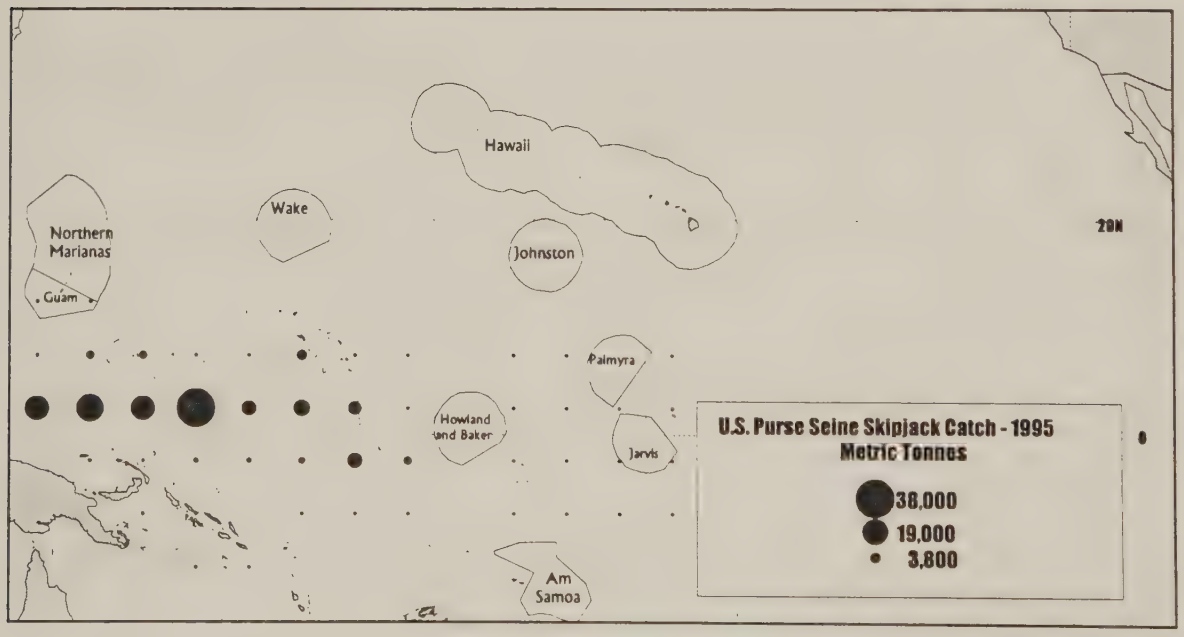


Figure 6. Distribution of United States purse seine catch of yellowfin tuna in 1995 by 5° geographic square. (Reported yellowfin catch includes an unknown proportion of bigeye tuna.).

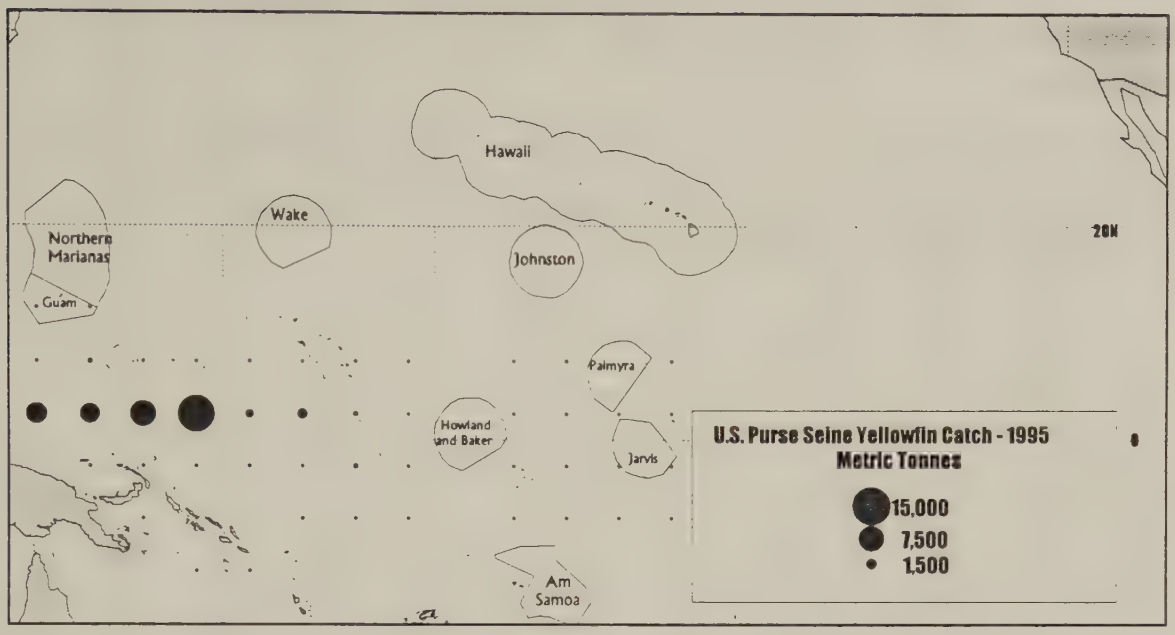


Table 2. United States purse seine tuna catches in U.S. EEZs in 1000s of pounds. (Yellowfin catch includes bigeye.)

Year	Country	Yellowfin	Skipjack
1990	Howland/Baker	18929	22718
	Palmyra	0	767
1991	Howland/Baker	55	3638
1992	Howland/Baker	6706	22143
1993	Howland/Baker	2743	25075
1994	Howland/Baker	6206	25721
	Jarvis	20430	9354
1995	**Howland/Baker**	**71**	**959**
	Average	6892	13797
	Std Deviation	8338	11188

Data

Data were supplied by the National Marine Fisheries Service Southwest Region from data reported under terms of the United States and Pacific Island multilateral fishing treaty.

Interpretation

The bulk of US purse seine activity occurs in the highly productive fishing grounds in the equatorial western Pacific, principally in the EEZs of Papua New Guinea, Federated States of Micronesia and Kiribati. There is sporadic activity in the US EEZ surrounding, Howland, Baker, Jarvis and Palmyra islands.

Table 3 Total western Pacific longline catch of PMUS 1962-1995 in 1000's pounds.

Year	Albacore	Bigeye.	Bluefin	Yellowfin	Black Marlin	Blue Marlin	Sword fish	Striped Marlin	Total
1962	26452	84058	3869	61481	570	23999	20786	26255	255548
1963	23748	103563	3667	73576	649	20136	20151	25238	281877
1964	26757	75191	1781	52607	654	17931	14424	66247	264503
1965	23202	63368	1437	64528	1097	15170	17146	51199	253599
1966	43085	65292	727	67782	774	13723	19323	31069	252509
1967	51014	77077	532	43625	607	13868	21157	45387	265030
1968	39743	60772	331	43339	336	11244	18412	60725	245839
1969	29531	76209	240	60908	504	13670	16992	34098	241720
1970	22788	62496	155	62838	356	18862	12974	58365	252284
1971	15327	60229	156	42806	431	10201	13263	45362	196209
1972	16667	82724	65	52788	560	12738	12301	27481	212982
1973	19319	60754	61	46732	377	11976	12075	27670	188392
1974	16072	67107	59	63820	303	12794	11666	28302	208910
1975	13489	61010	34	52116	227	7969	13281	20387	173137
1976	21457	79067	65	62113	238	8999	15587	21312	215199
1977	20873	92169	191	76262	215	8486	15248	9749	226201
1978	17322	83753	273	110794	284	10862	14833	9845	250638
1979	19809	91346	197	91134	370	10324	16384	19470	252487
1980	20376	67490	83	93612	299	10666	12123	23939	231007
1981	28703	61505	215	65734	226	10309	14451	19938	202307
1982	24895	76303	211	54402	170	10703	12376	21929	202023
1983	19344	68420	74	55613	178	7874	15225	15369	182612
1984	21981	75610	53	51317	204	12063	14463	14830	190954
1985	20332	76632	33	40547	221	9684	18658	16030	182455
1986	14881	75744	27	46011	107	11578	17598	24229	190542
1987	16565	93220	85	51613	248	10476	19536	23064	215415
1988	15915	66700	53	36640	242	10338	17430	27391	175216
1989	14575	82347	34	37412	320	9635	13874	19833	178613
1990	15534	83191	43	42259	75	7481	11401	9945	170171
1991	17204	69974	42	36143	118	7934	9838	13152	155670
1992	18643	81868	70	45461	176	5822	9827	11500	174510
1993	24783	73466	161	42122	200	8701	11549	15821	178748
1994	24274	76378	206	39359	202	7757	9893	12288	171860
1995	**10253**	**48975**	**34**	**41214**	**61**	**5961**	**4414**	**8799**	**121181**
Ave.	22203	74235	449	56138	341	11469	14666	26065	210599
S.D.	8502	11585	924	17383	223	4003	3704	15225	38116

Data

Data on total longline catches in western Pacific were gleaned from the 1995 South Pacific Commission (SPC) Tuna Fishery Yearbook. Fleets included are from American Samoa, Australia, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Japan, Korea, Marshall Islands, New Caledonia, New Zealand, Papua New Guinea, Solomon Islands, Tonga, Taiwan, United States, and Western Samoa. Longline catch is reported to the SPC in "pieces" and converted to weight (metric tons) using average weight estimates for each species. These weights are expressed in pounds in this report.

Figure 7. Longline tuna catches, 1962-1995.

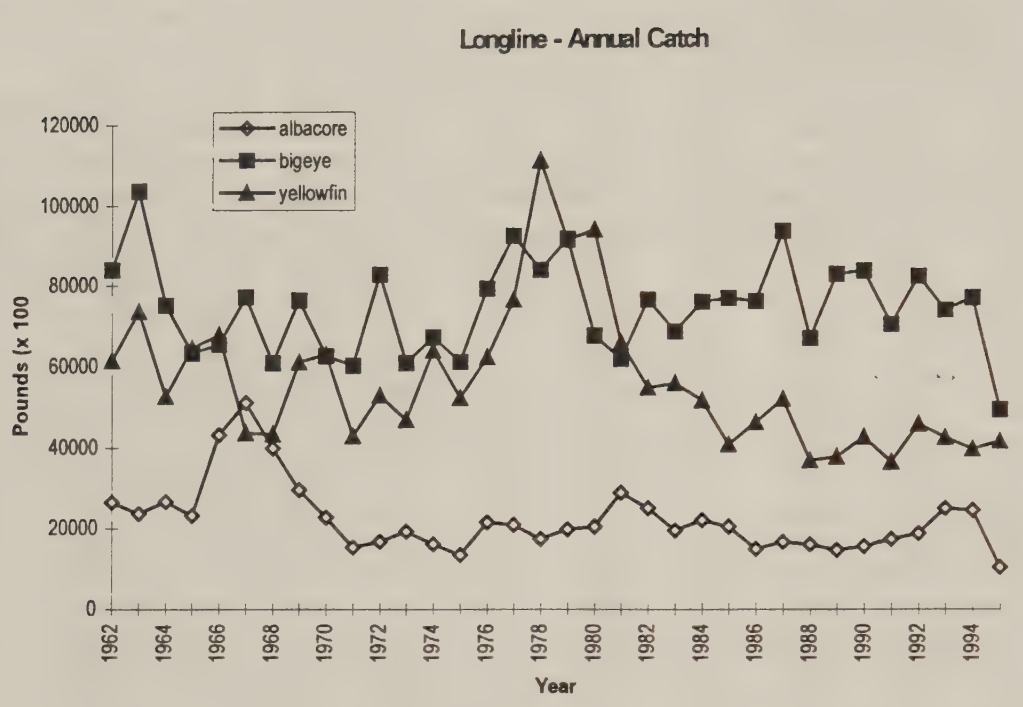


Figure 8. Distribution of longline catches of all tuna species in 1995. NB, does not include data from Hawaii-based longline fishery.

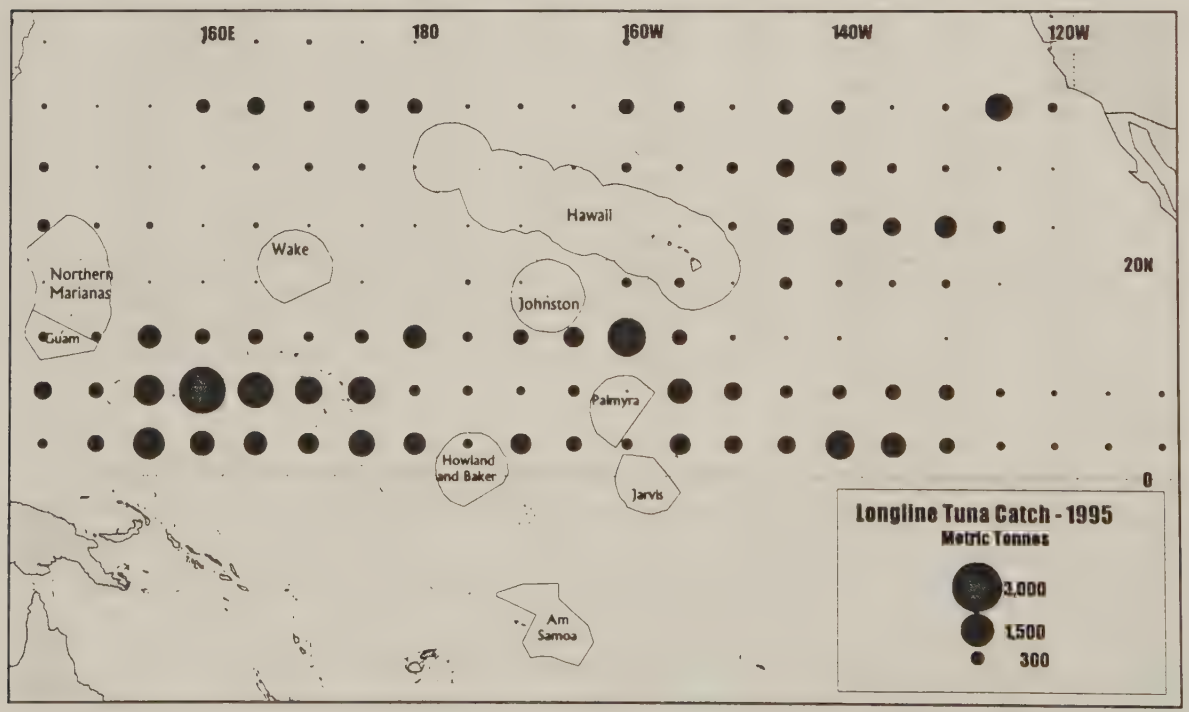


Figure 9. Distribution of longline catches of yellowfin tuna in 1995. NB, does not include data from Hawaii-based longline fishery.

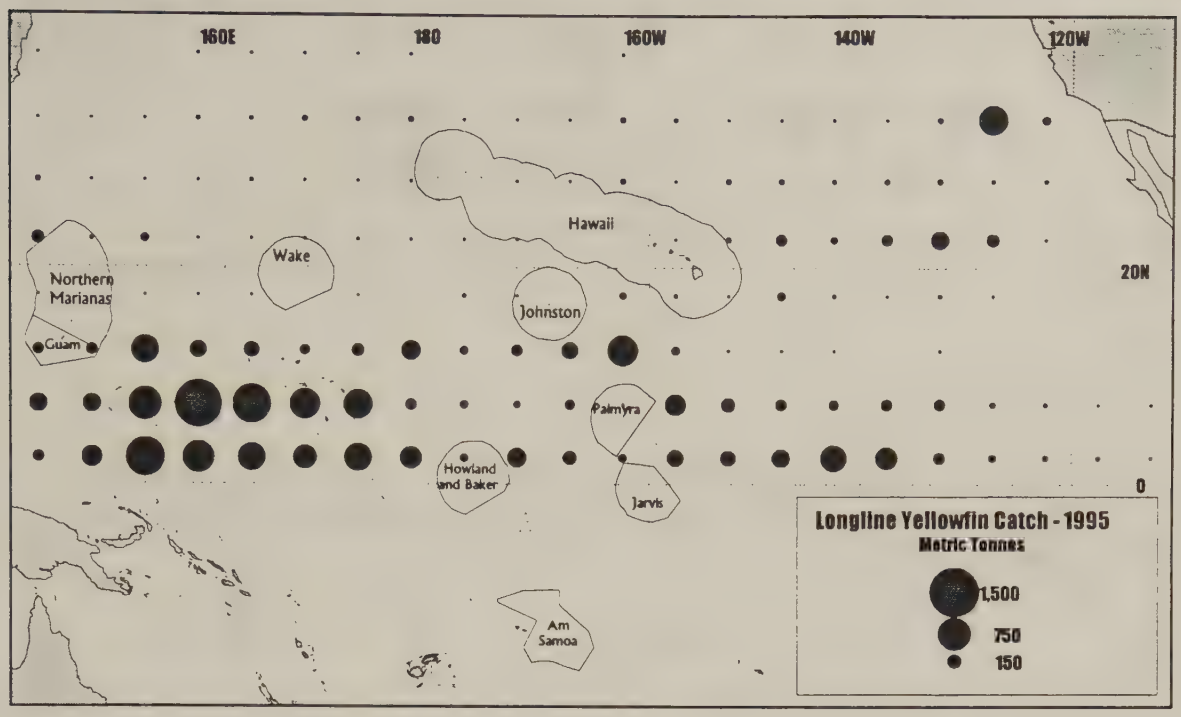


Figure 10. Distribution of longline catches of bigeye tuna in 1995. NB, does not include data from Hawaii-based longline fishery.

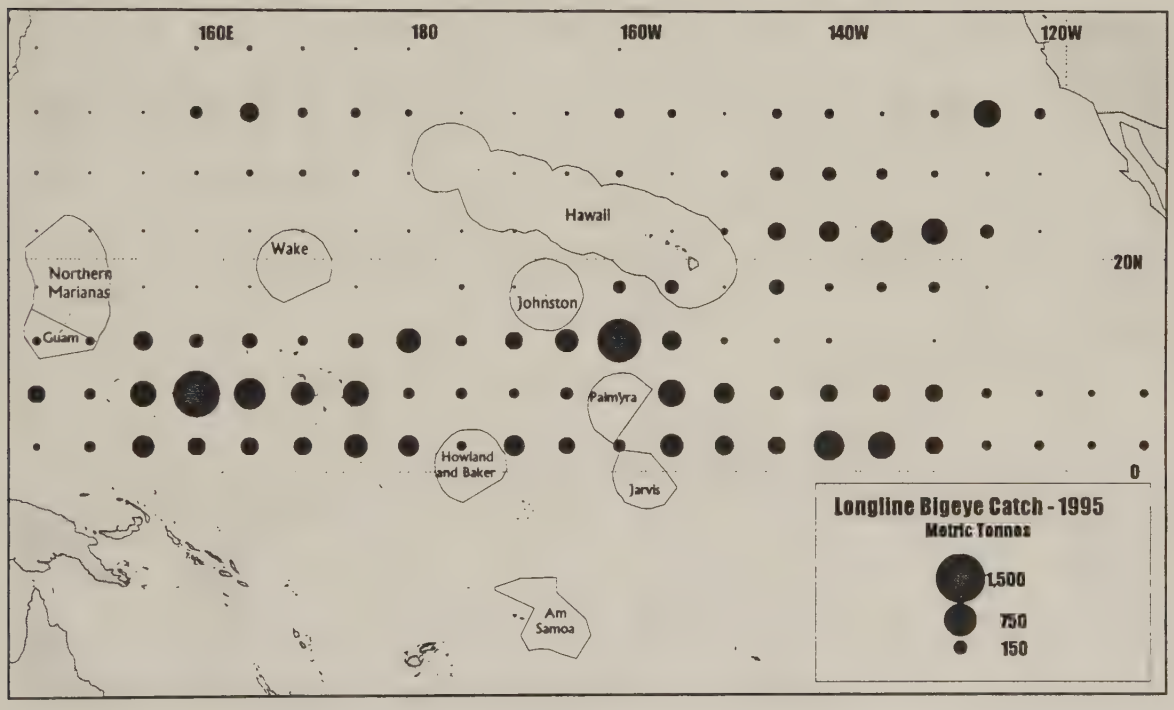


Figure 11. Distribution of longline catches of albacore tuna in 1995. NB, does not include data from Hawaii-based longline fishery.

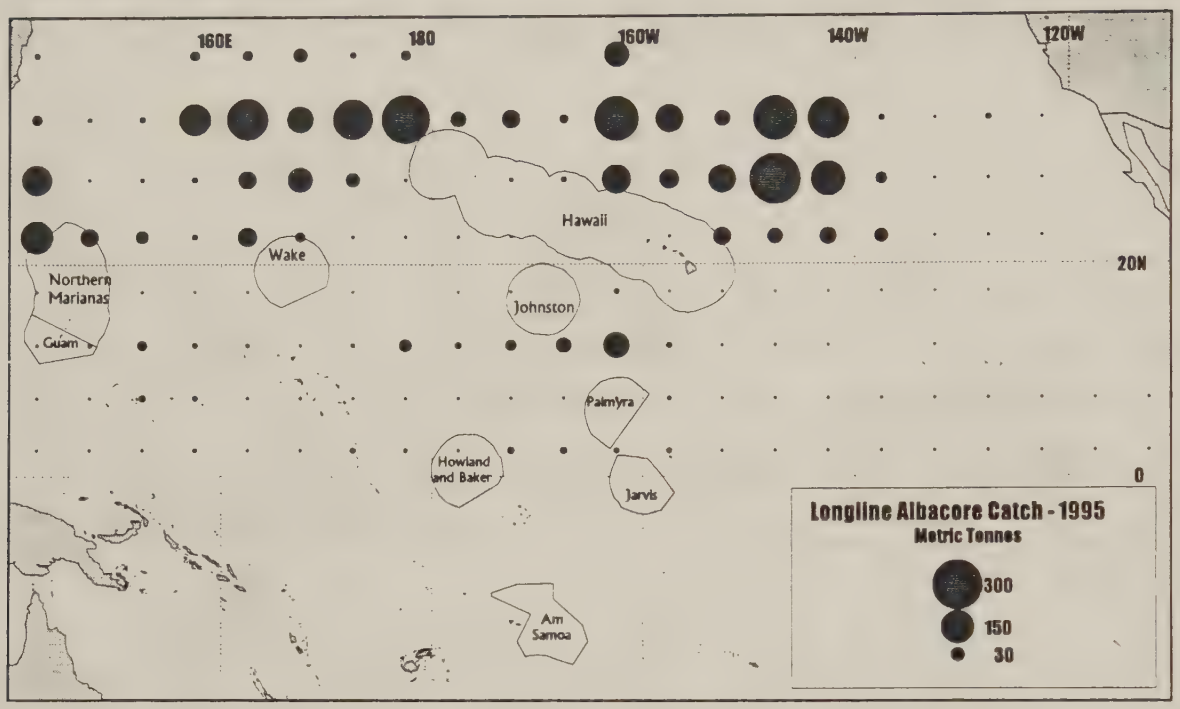


Figure 12. Distribution of longline catches of bluefin tuna in 1995. NB, does not include data from Hawaii-based longline fishery.

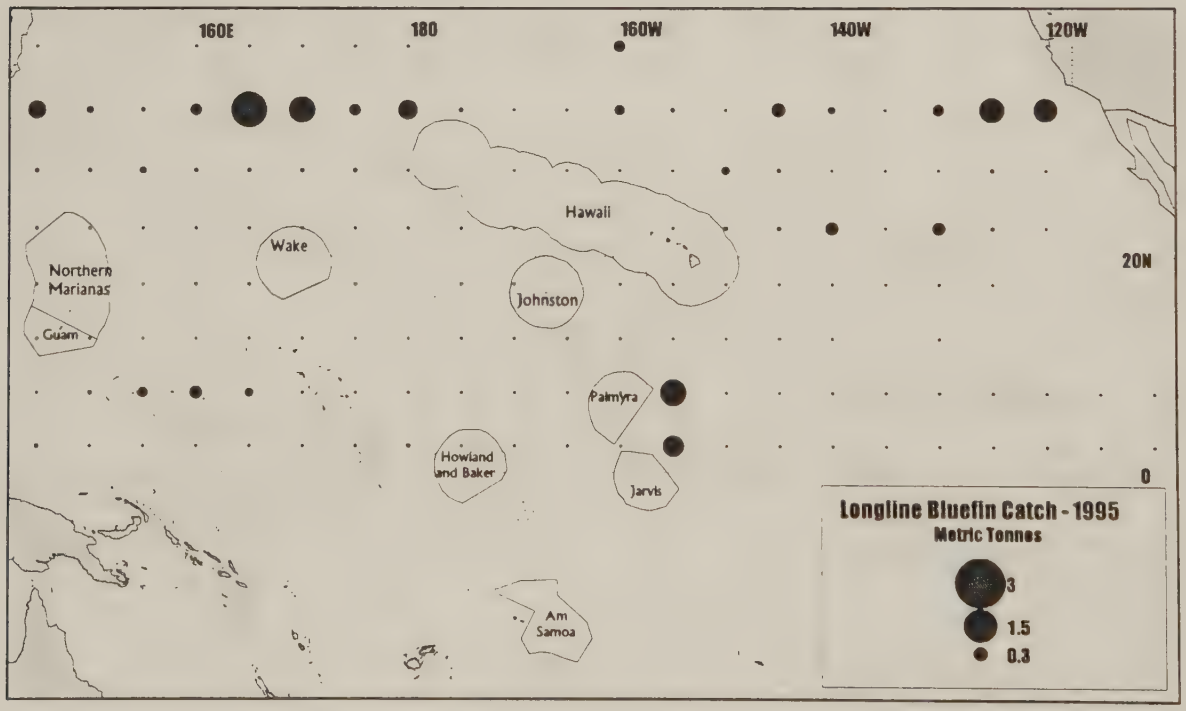


Figure 13. Longline billfish catches in the SPC Statistical Area, 1962-1995.

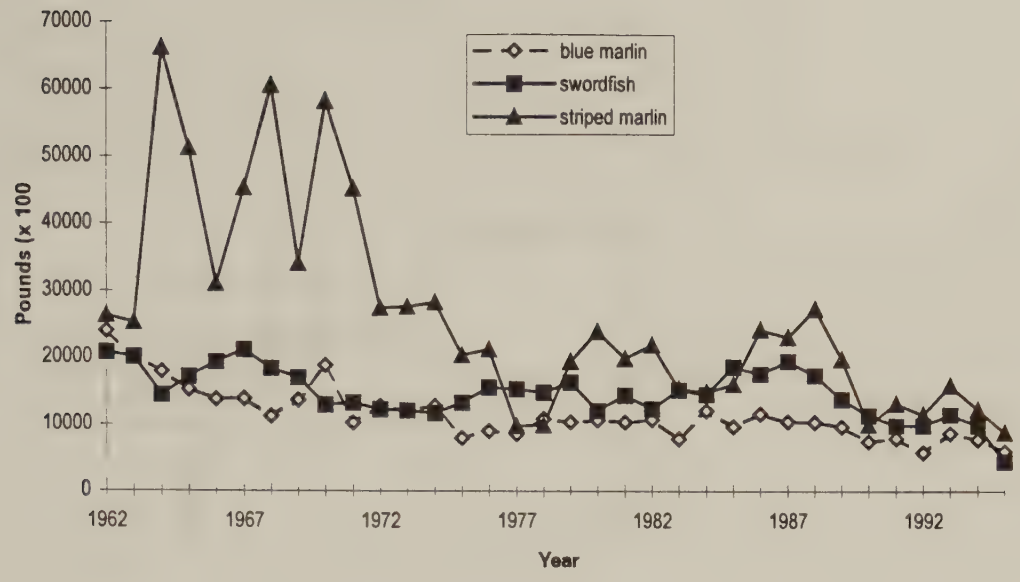


Figure 14. Distribution of longline catches of swordfish in 1995. NB, does not include data from Hawaii-based longline fishery.

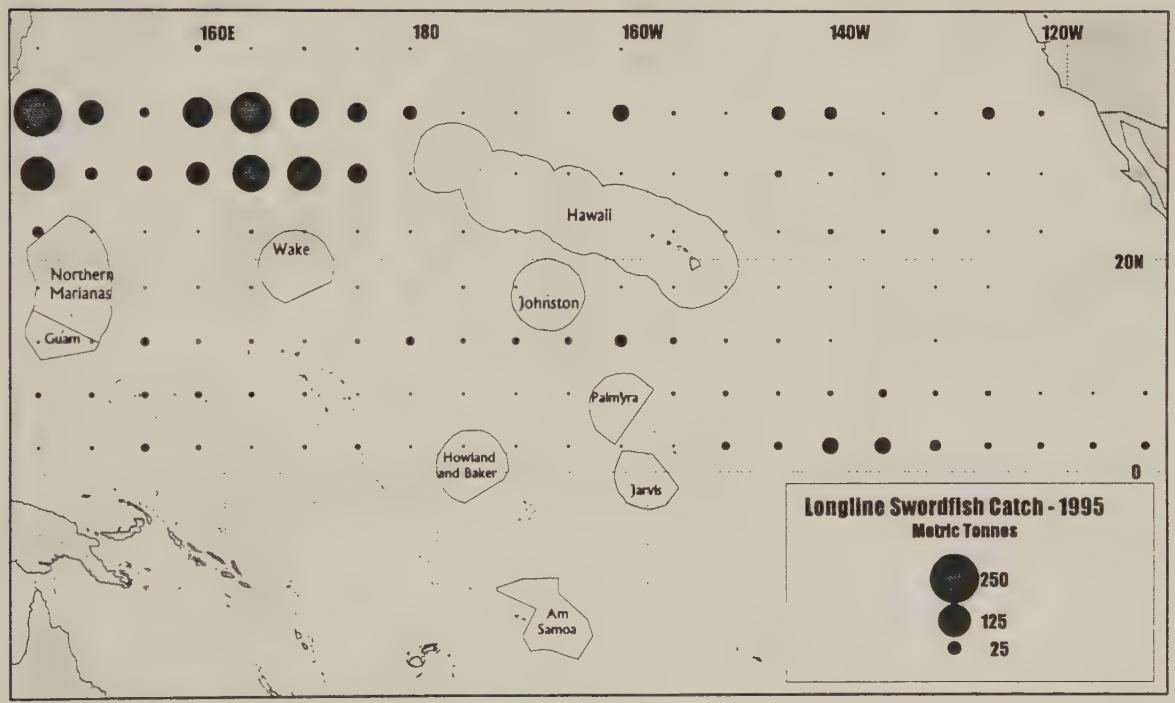


Figure 15. Distribution of longline catches of blue marlin in 1995. NB, does not include data from Hawaii-based longline fishery.

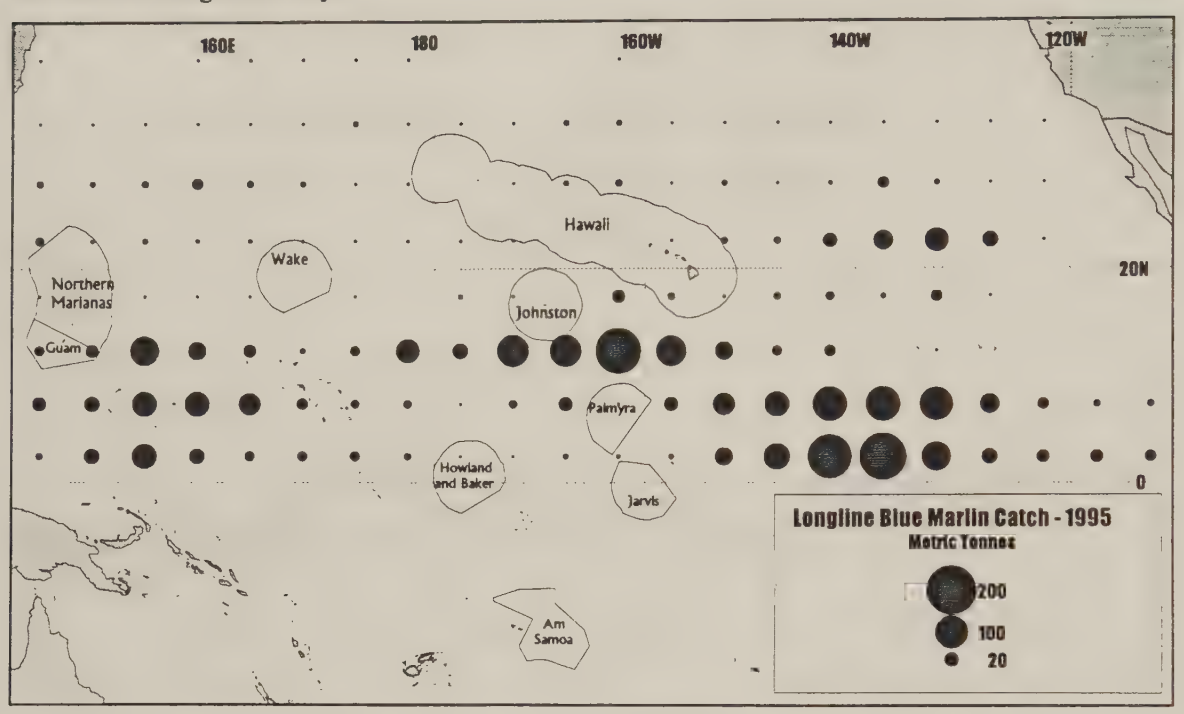


Figure 16. Distribution of longline catches of striped marlin in 1995. NB, does not include data from Hawaii-based longline fishery.

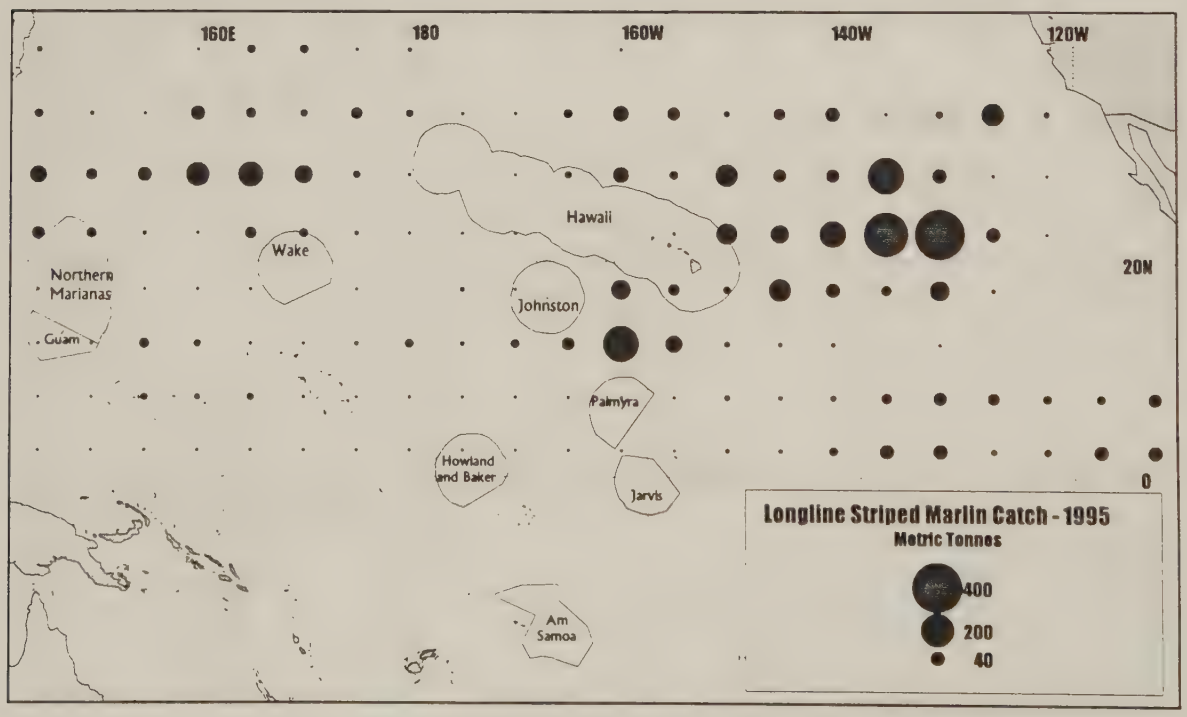


Table 4. Total western Pacific pole and line catch of skipjack 1972 -1995 in 1000s of pounds.

Year	Skipjack
1972	289197
1973	431541
1974	365974
1975	347473
1976	404388
1977	473085
1978	472421
1979	449391
1980	488963
1981	388818
1982	391813
1983	454390
1984	577268
1985	273679
1986	430510
1987	378351
1988	408763
1989	337576
1990	216121
1991	288620
1992	246118
1993	81793
1994	61915
1995	**47360**
Average	346064
Std Deviation	137373

Figure 17. Total western Pacific pole and line catch of skipjack 1972 -1995 in 1000s of pounds.

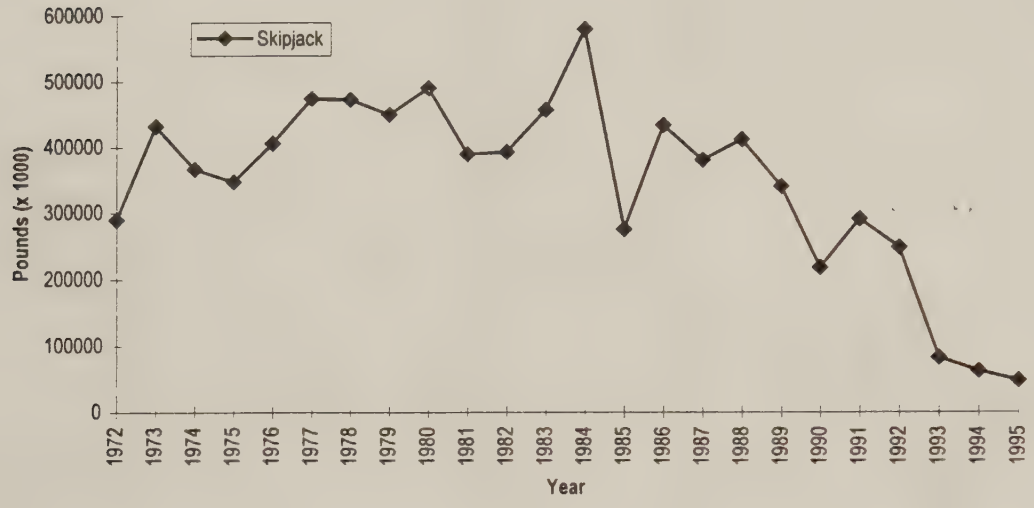


Figure 18. Distribution of pole and line catch of skipjack in 1995 by 5° geographic square. NB Japanese fleet only, does not include domestic fleets based in South Pacific Islands

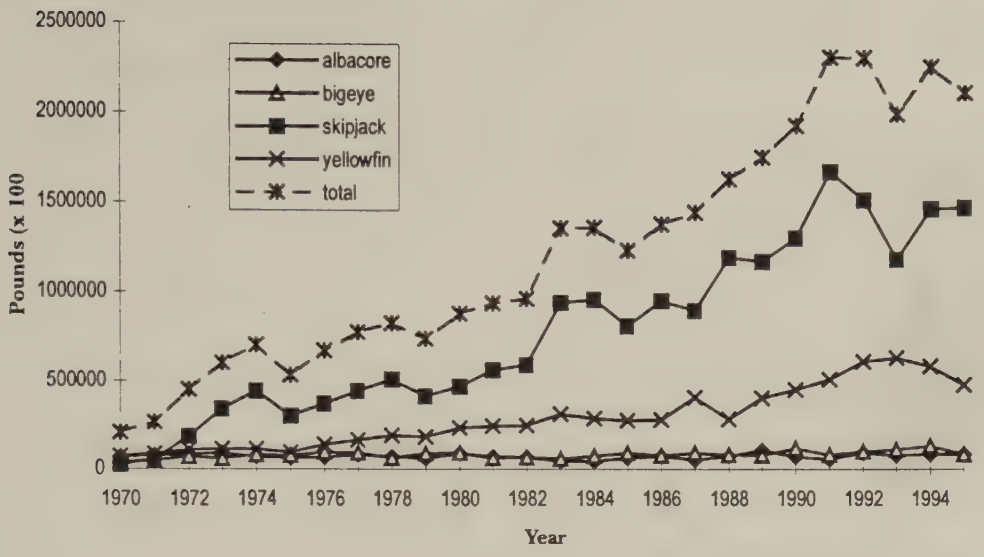
Data

All data on pole and line landing were supplied by the SPC. Fleets included are from Australia, Fiji, French Polynesia, Japan, Kiribati, New Caledonia, Palau, Papua New Guinea, Solomon Islands, and Tuvalu. "The most recent catch statistics available for the Japanese fleet, which account for over half the total pole-and-line catch in the SPC statistical area, are for 1994; therefore, the estimates of the total pole-and-line catch during 1995 given [in the 1995 SPC yearbook] should be considered preliminary". The lack of catch reported north of 15° N also indicates incomplete data from the pole and line fleets.

Table 5. Total annual catch of tuna species in 1000s of pounds in the SPC statistical area.

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
1970	70016	39094	23739	71802	204651
1971	75607	48175	53422	87443	264647
1972	82928	69039	185568	109652	447188
1973	91453	57650	339120	111689	599914
1974	67897	78243	441612	111321	699074
1975	61255	74970	300626	93786	530636
1976	66114	94412	369361	136720	666607
1977	79048	90631	441308	162338	773325
1978	67071	61566	506981	189635	825252
1979	56094	86098	410944	182380	735516
1980	87756	91804	466987	230317	876864
1981	68479	62236	561373	242987	935074
1982	63545	63885	587753	245222	960405
1983	44564	58453	939349	311404	1353770
1984	43140	71081	958560	285255	1358036
1985	60177	89260	809697	274572	1233705
1986	71594	75977	950564	278523	1376658
1987	52205	89714	897008	403949	1442875
1988	73272	78631	1193936	281867	1627707
1989	104749	75415	1171348	399496	1751008
1990	68345	114926	1299166	446989	1929426
1991	54112	80933	1673463	505416	2313924
1992	90737	96994	1513246	607173	2308150
1993	75605	108951	1181154	626816	1992526
1994	84785	130799	1462066	580676	2258326
1995	**84443**	**82183**	**1470118**	**475773**	**2112516**
Average	70961	79658	777249	286662	1214530
Std Deviation	14859	20435	481738	169977	655710

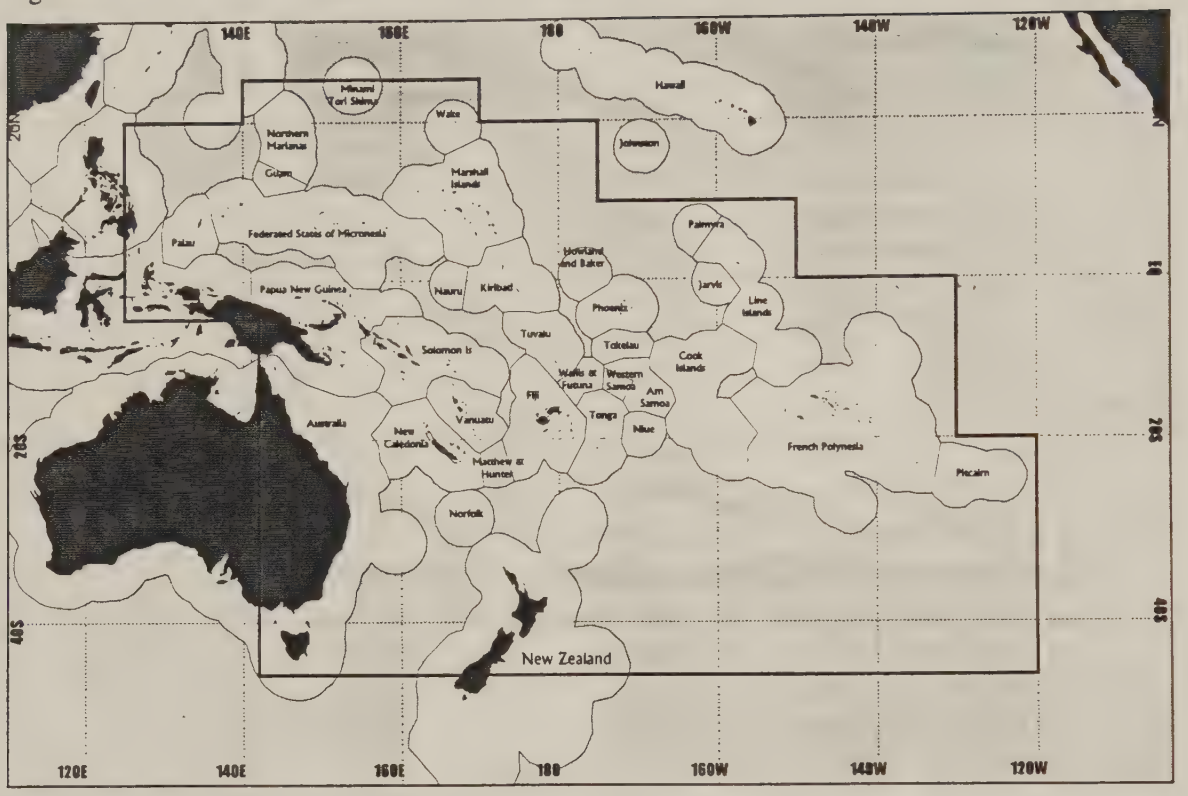
Figure 19. Total annual catch of tuna species in the SPC Area, 1970-1995.



Data

Data on total longline catches in western Pacific were gleaned from the 1995 South Pacific Commission (SPC) Tuna Fishery Yearbook. Fleets of all nations reporting catch in the SPC statistical area are included.

Figure 20. South Pacific Commission Statistical area.



Appendix 6

Recent research on pelagic fisheries: 1996-97 Honolulu Laboratory

Stock Assessment Investigation

- Second International Pacific Swordfish Symposium

The Second International Pacific Swordfish Symposium was held 3-6 March 1997 at the Turtle Bay Hilton, Oahu. NMFS Honolulu Laboratory scientists Gerard DiNardo was symposium chairperson. The Symposium Steering Committee included members from the NMFS Honolulu Laboratory, NMFS La Jolla Laboratory, National Research Institute for Far Seas Fisheries (Japan) and CICESE (Mexico).

Symposium participants reviewed the status of Pacific swordfish resources, alternative approaches to swordfish stock assessment, and biological and oceanographic research critical to improved swordfish stock assessment. Proceedings will be available later in the year (1997).

- ISC Swordfish Working Group

NMFS hosted the first meeting of the Swordfish Working Group, a subsidiary body of the International Scientific Committee for Tuna and Tuna-like Fishes of the North Pacific Ocean (ISC) on 7 March 1997. Drawing upon results of the Swordfish Symposium, the Working Group, chaired by NMFS Honolulu Laboratory director R. Michael Laurs, considered priority objectives of the ISC with respect to swordfish and identify actions, including data sharing and research, required to meet the objectives.

- Status and Assessment of Pacific Billfishes

NMFS Honolulu Laboratory scientist Robert Skillman gave a presentation entitled "The Status of Pacific Billfishes and the Assessment Process" at "Getting Ahead of the Curve, A Symposium on Managing Highly Migratory Fish of the Pacific Ocean". This symposium was sponsored by National Coalition for Marine Conservation during 4-6 November 1996 in Monterey, California. Skillman reviewed assessments of billfish resources in the Pacific, critiqued the process involved in conducting assessments, and suggested ways to improve the collaborative assessment process.

- Estimation of Turtle and Seabird Takes and Mortalities in the Hawaii Longline Fishery During 1994 and 1995

Skillman made the first estimates of the levels of incidental take and mortality of sea turtles during 1994 and 1995 in the Hawaii longline fishery, using logbook and observer data. The estimates indicated that the 1995 incidental take of loggerhead turtles exceeded the

allowable level. Hence, the NMFS SWR has begun an internal consultation on the matter as required under Section 7 of the Endangered Species Act.

Skillman also computed estimates of seabird mortality in the 1994 and 1995 Hawaii longline fisheries. These estimates were provided to the U.S. Fish and Wildlife Service.

Subsequent work on both turtles and birds has been taken up by former NMFS La Jolla laboratory scientist Pierre Kleiber who has moved to the Honolulu Laboratory to head up by-catch work.

- Analysis of Factors Affecting Turtle Takes in the Hawaii Longline Fishery

Skillman and Kleiber analyzed Hawaii longline observer data to identify operational and environmental factors related to high take rates of sea turtles. Using a statistical method called "regression trees", they determined that the factors linked to high turtle takes were those identified with swordfish fishing operations. The analysis was limited by the small amount of data available and the relative rarity of turtle encounters. This research is on-going and contributes to the Section 7 consultation under the Pelagic fisheries FMP.

- Computation of Turtle and Seabird Takes and Mortalities in the 1996 Hawaii Longline Fishery

Kleiber is using data from Hawaii longline fishery logbooks and the SWR observer program to estimate the total number of sea turtles taken incidentally by the fishery during 1996 and the associated level of mortality. A similar analysis is being carried out with respect to seabirds. The results will be provided to the SWR and reported in accordance with requirements of the Section 7 Biological Opinion for the longline fishery.

- Status of Pacific Sea Turtles Relevant to Incidental Takes in the Hawaii Longline Fishery

Laboratory scientists Jerry Wetherall and George Balazs co-authored (with Alan Bolten, University of Florida) the report of a workshop convened in Honolulu in December, 1995, to review the status of sea turtle populations impacted by the Hawaii longline fishery. The report summarizes current knowledge of life history and population trends for key turtle populations (Japanese loggerheads, Mexican and Malaysian leatherbacks) and tentative results of fishery impact assessments using a variety of quantitative approaches. The report emphasizes the dearth of reliable information about sea turtle population biology, population status, and levels of human take (including incidental fishing mortality) and recommends steps to fill information gaps

- Simulation Model for Assessment of Fishery Impacts on Sea Turtle Populations

Wetherall further developed a simulation model (TURTSIM) for analysis of sea turtle population dynamics and assessment of human (e.g., fishery) impacts. The model was used for provisional analysis in support of the ongoing Section 7 consultation for the Hawaii longline fishery. A graphical user interface for the model is being developed by JIMAR researcher Tim Yan in collaboration with Wetherall.

- Survey Design for Hawaii Longline Fishery Observer Program

Skillman, Wetherall and DiNardo developed a set of recommendations for redesign of the SWR longline fishery observer program, with the principal objective of estimating turtle takes by the fishery in the most reliable and practical manner. Heretofore, the observer trips have been allocated among categories of fishing (swordfish, tuna, switcher, or mixed target) in proportion to the expected number of trips in each category. In the recommended revised survey design, observer trips would be allocated according to a vessel's overall length, with proportionally greater observer effort devoted to trips by larger vessels, which tend to target swordfish and have higher encounter rates with turtles. The recommendations are being reviewed by the SWR.

- Honolulu Laboratory Oracle Database for Pelagic Fisheries

The Oracle Pelagics Development Group (chaired by Robert Skillman and including members from the Honolulu Laboratory's Stock Assessment Investigation, Information & Technical Services, and the Fishery Management & Performance Investigation, as well as JIMAR, developed and implemented a second version of the generalized Oracle database design. Longline logbook data for 1995 and 1996 have been loaded into the database (there are no impediments to loading all of the data later). Procedures are being developed for loading data from the SWR longline/turtle observer program. An Oracle-based menu system is being developed to enable a user to examine, select, and download data from the Oracle database and produce summary data reports.

As a test of the Oracle system, the tabular segment of the quarterly longline logbook report that the Honolulu Laboratory distributes to the Council has been successfully duplicated. Support for user access to text and graphical components of the quarterly report (the graphs display information by quarters across years) is now under development. Development of database access software has been enabled by funding from the JIMAR Pelagic Fisheries Research Program.

- SWR/SWFSC Pelagics Database Management Team

Terms of reference are being drafted by Wetherall for a SWR/SWFSC team tasked with developing and implementing a comprehensive strategy for pelagic fishery database management within the NMFS Southwest Region. A key objective is to implement Oracle database

technology now under rapid development in the Honolulu and La Jolla Laboratories and provide for convenient and efficient access to pelagic fishery information by fishery scientists, WPRFMC staff, members of the fishing industry and the public. Information on this team will be available after it is formally constituted.

- Analysis of Shark Bycatch Patterns in Hawaii Longline Fishery

Kleiber conducted a preliminary examination of the log book and observer data pertaining to shark bycatch and finning with an another year of data added to the previous analysis of JIMAR researcher Xi He and Laboratory scientist Christopher Boggs. The results were presented at the 1997 JIMAR program review. An assistant researcher is being recruited for a Pelagic Fisheries Research Program project to conduct more penetrating analysis of bycatch of sharks and other species in the Hawaii longline fishery.

- Landings of Small Swordfish by Hawaii Longline Fishery

Wetherall with Laboratory scientists Russell Ito and Ed DeMartini combined length-weight relationships and NMFS landings statistics to estimate the fraction of swordfish landed by Hawaii-based longliners that are shorter than 29 inches CKL (cleithrum-keel length). A CKL of 29 inches is being evaluated by ICCAT as a possible minimum allowable size for swordfish landed in the Atlantic, where high catches of small swordfish are of great concern. The Honolulu Laboratory analysis showed that during recent years fewer than 6% of swordfish landed in Hawaii have been shorter than 29 inches CKL. This figure is much less than that in the Atlantic, indicating that management measures for swordfish must be developed and applied on a stock-specific basis.

- Interactions between Handline and Longline Fishing at Cross Seamounts

Skillman and Kleiber compiled Hawaii longline fishery statistics to help the Council assess the nature and magnitude of interactions between tuna handline and tuna longline fishing at Cross Seamounts.

Future activities

- Review and Evaluation of Overfishing Guidelines

As part of NMFS implementation of the Magnuson-Stevens Act, the NMFS will review current overfishing guidelines for pelagic resources in the Western Pacific Region, as stipulated in the Pelagics FMP, and ascertain what steps are necessary to bring the FMP guidelines into compliance with the Act. The evaluation of overfishing guidelines will take into consideration the "precautionary principle" and other new aspects of the Magnuson-Stevens Act.

- Comprehensive Monitoring of Longline Fishery Bycatch

In view of new mandates to monitor and minimize bycatch in U.S. fisheries, the NMFS will develop and implement statistical procedures for routinely estimating and reporting bycatch levels in pelagic fisheries. Estimates will be computed of the retained and discarded quantities of all fishes (target and non-target species), and levels of interaction with protected species.

- Swordfish Stock Assessment

In accordance with recommendations of the ISC Swordfish Working Group, NMFS will undertake a collaborative stock assessment of Pacific swordfish resources and evaluate the impact of the Hawaii longline fishery and other fisheries harvesting swordfish. The assessment will help identify any needs for management action and additional research required to improve the reliability of assessments.

Life History Program

- Swordfish ageing studies

Life history program scientists completed examination and analysis of "daily" microincrements for 15, putative YOY, yearling and age I+ swordfish. Completed preliminary marginal increment analysis of anal fin ray cross-sections for about 300 swordfish, collected during Mar94-Jul96 by Southwest Region observers.

Program scientists are currently evaluating otolith "daily" microincrement counts as an age estimator for larger immature and subadult fish of ages I+ to II. The objective here is to corroborate the annular nature of bands seen in anal fin ray cross-sections for fish of this age range. Continuing preparation of anal fin ray cross-sections, with emphasis on small (< 100 cm eye-to-fork length, EFL) and very large (> 200 cm EFL) fish for the time period (Sep-Dec) most lacking in hardpart collections. Also continuing with marginal increment analysis of fin rays for fish of all sizes (current sample size approx. 450 fish).

The Life History Program plans to further extend otolith microincrement studies to corroborate fin ray ages for fish of age group III if possible. Following arrival of a new researcher from La Jolla, the Program will resume examination of whole otolith SEM photo library and re-evaluate whole otoliths as ageing structures for swordfish. Also possible continued collaboration with John Kalish of the Australian National University, evaluating bomb carbon ages of very large swordfish using vertebrae.

- Swordfish reproductive studies

Laboratory scientist Edward DeMartine, with University of Rhode Island research Jennifer Specker, completed "Results of a pilot test for the presence of vitellogenins in muscle tissue of swordfish (Xiphias gladius) sampled at the Honolulu fish auction". These preliminary results were encouraging but only partly successful because the polyclonal antibody that was

used was not species-specific and cross-reacted with other proteins. Also completed statistical analysis of size at maturity data for swordfish caught by the Hawaii longline fishery during Mar94-Jul96.

Program scientists are currently finishing the writing of a manuscript on body size at sexual maturity and sex-specific size composition of catch in the Hawaii longline fishery.

Program scientists have scheduled collection of blood and muscle tissue specimens on March-April Cromwell research cruise, for development of a swordfish-specific, monoclonal antibody assay by Dr. Nancy Denslow's Laboratory at the University of Florida, Gainesville. The purpose here is development of an assay to determine the sexual identity of dressed swordfish at auction. A paper on swordfish size at maturity and sex-specific size composition of catch in the Hawaii longline fishery will be presented at the 48th Annual Tuna Conference (May 1997).

Fish Ecology Program

- Pelagic fishery dynamics: Evaluation of the catch-competition of fishery interaction between small-vessel troll and handline fisheries and the Hawaii-based longline fishery

Three papers were published on this subject including a discussion of general issues and problems with fishery interaction research (Boggs 1996), and the two papers published with JIMAR scientists investigating local depletion of yellowfin and bigeye tuna (He and Boggs 1997). Very little evidence was found to support the idea that local fishing pressure causes local depletion of these resources in Hawaii. In 1997 work continued to evaluate local depletion of blue marlin with similar results.

- Catch and effort information needed to evaluate the dynamics of Hawaii's pelagic fisheries

Three papers were written in collaboration with JIMAR scientists. A NOAA NMFS Technical Memorandum (Curran et al 1996) was published on the NMFS longline statistics summarized by calendar quarter and five degree square. Another paper by Curran et al (in preparation) is an examination of the utility of State catch data (reported by date without explicit effort) for estimation of catch-per-day-fished indices. This paper investigates zero-catch trip biases and makes a correction for reporting errors in 1978-79. The third paper (He et al in press) develops methods to categorize individual longline sets into groupings for indicating spatially-resolved trends in apparent fish abundance or fish availability.

- Environmental variation and several operational characteristics on the performance of the Hawaii-based longline fishery for swordfish.

A paper was completed in collaboration with the JIMAR program (Bigelow et al., in review). This paper showed how sea surface temperature features, fishing areas and other factors significantly affected catch-per-unit-effort (CPUE) for swordfish and blue shark. Preliminary results of this study and the results of Honolulu Laboratory and JIMAR research on swordfish

dynamics were discussed at a meeting in March 1996, which addressed Council concerns regarding a 1993-1994 decline in swordfish catch and CPUE. A summary report of these discussions was complied and included in the Council's 1995 Annual Report on Pelagic Fisheries of the Western Pacific Region. At the request of the Pelagic Plan Team, a brief review of bluefin tuna landings by the Hawaii-based fishery and a comparison with other North Pacific harvests was also provided for the 1995 Annual Report.

- Incidental catch of Blue Shark by the Hawaii Domestic Longline Fishery

In collaboration with JIMAR a paper was completed on the incidental catch of blue shark as estimated from logbook data and observer data (He and Boggs in review). A summary of the results was also included in the Council's 1995 Annual Report. There appeared to be no substantial blue shark under-reporting for the portion of the longline operations responsible for the great majority of blue shark catch (swordfish fishing operations). This project continues under new leadership in the Stock Assessment Investigation.

- Pop-up Satellite Transmitting Archival Tags

Development and testing of methods for the external attachment of pop-up archival tags of swordfish continued throughout the year. A tag anchor was successfully developed that retained dummy archival tags in caged southern bluefin tuna. Research cruises on the NOAA ship Townsend Cromwell explored methods for catching more swordfish in viable condition for tag and release but this work was hampered by bad weather and ship breakdowns. Several more conventional tag recoveries were made bringing the total to 4 out of the 422 swordfish tagged so far in Hawaii based longline fishery. We will be attempting to expand this conventional tagging program but many of the most active participant were absent from the fishery in 1996.

- Swordfish food habits

In collaboration with the Ecosystem and Environment Investigation, a study of swordfish food habits has made progress in quantifying diet of swordfish and the and the importance of omastrephid squid to swordfish distribution. A small effort is also underway to develop a trophic model for the community of pelagic species in the central North Pacific. It is hoped that such a model may provide a useful tool for investigating qualitative effects of varying exploitation rates on target species, forage species, bycatch species and incidental species in relation to their life history characteristics to see if useful generalities emerge.

<u>Ecosystem and Environment Investigation</u>

- The Investigation conducted the May 1996 oceanographic cruise. Analysis of May 1996 research cruise to swordfish grounds to identify physical and biological factors which are the basis of the fishing grounds is on-going. A follow-up cruise will be conducted in May 1997.

- Laboratory scientist Jeffrey Polovina and colleagues applied TOPEX satellite altimetry data to describe the spatial and temporal dynamics of mesoscale features in the swordfish fishing grounds and their links with fishery CPUE. Links between Hawaii longline CPUE and large-scale features such as the Kuroshio Extension Current dynamics are also being addressed. This research will be continued with satellite altimetry data, cruise data, and fishery data to describe the environmental dynamics of the swordfish fishing grounds and its impact on the fishery.

Additional Ecosystem and Environment Investigation research includes:

- Developed algorithm to produce maps of geostrophic current from satellite altimetry.
- Description of swordfish diet from stomach contents.
- Determination of the spatial and temporal distribution of catches of juvenile swordfish from observer and logbook data to describe juvenile swordfish habitat and juvenile discard rate.
- Contribute 4 presentations and 2 posters on the work listed above to the Swordfish Symposium (1997).
- Analyzed the spatial and temporal dynamics of mahimahi catches in the Hawaii longline
- Manuscript on distribution and biology of salmon and blue sharks in North Pacific - Fisheries Research (In Press).
- Presentation at the 1996 Lake Arrowhead Tuna Conference on ocean features in Hawaii's swordfish fishery grounds from an ocean circulation model.

Fishery monitoring developments

- Hawaii-based domestic longline logbooks

The Fishery Monitoring & Economics Program (FMEP) of the Honolulu Laboratory, NMFS, continues to take the lead responsibility in collection, compilation and summarization of Federal logbooks for domestic U.S. longline fishing vessels based in Honolulu. (Logbooks by vessels operating on other Hawaiian islands are mailed to the NMFS Pacific Area Office and then processed by FMEP staff.) This monitoring process includes working with fishermen on species identification as well as on accurate logging of number kept and number released. There continue to be some problems with identification of black, blue, and striped marlins by some vessel captains. FMEP staff also assign a "trip type" variable to each longline trip which is used in preliminary screening and reporting of longline activity by species target (tuna, mixed,

swordfish). A separate category for the number of sharks "finned" was implemented in 1996. This provides more detailed information on shark landings in terms of product form. A comprehensive report with five breakdowns of catch information, a table of protected species interactions, and 34 figures is issued quarterly.

- Longline shark finning

FMEP staff completed the first summary of shark finning information based on logbooks from the Hawaii-based longline fleet. This summary was presented to the Council during 1996 and develops concerning shark finning will be monitored throughout 1997.

- Longline logbook data summaries

Data from the Hawaii-based domestic longline logbooks are maintained in a dBaseIV data base system which allows a variety of reports, including summaries by specific areas, as well as generation of secondary data sets by 1-, 5-, and 10-degree latitude-longitude squares.

- Longline landings

FMEP staff also monitor the Honolulu markets and brokerage houses to acquire information on average weight and prices of individual species. This information is utilized to generate the total landings figures in the annual report module as well as to prepare a more detailed status report on the longline fishery (Ito, 1997). Critical information includes detailed size composition information which is included in Ito's report.

- Swordfish data catalog

Laboratory scientist Russell Ito, and Al Coan of the Southwest Fisheries Science Center in La Jolla, completed a report for the swordfish symposium (Ito and Coan, 1997), which includes a comprehensive data dictionary for the U.S. swordfish fisheries in the North Pacific.

- American Samoa domestic longline fishery

In 1996, the American Samoa domestic longline fishery developed and FMEP issued the first annual report on catch, effort, and landings based on the generic western Pacific longline logbooks. Additional work needs to be done with fishermen in American Samoa to assist in providing good data. Catch statistics are included in the regular WPacFIN annual reports for American Samoa.

Socio-economic research

- Hawaii pelagic fishing vessels economics project

The *Hawaii Fleet, Industry, and Vessel Economics (HIFIVE)* project is completing its third year. The objective of this research is to provide fishery management information based on the economic characteristics and dynamics of the Hawaii longline and troll-handline fishing fleets.

The project currently consists of two major components: a detailed cost-earnings analysis of the Hawaii-based domestic longline fishery; and, comprehensive information on the cost-earnings of the small boat pelagic fishery in Hawaii.

Progress in 1996 centered on three areas: publishing the results on the cost-earnings of the longline vessels; completing initial economic analysis of longline fishing dynamics; and collection of basic information from the small boat pelagic fishery.

- Hawaii longline economic research

The longline cost-earnings information has been published in two sources (see Publications) and has been presented at the 1995 Lake Arrowhead Tuna Conference, the 1995 PFRP Symposium, the 1996 SOEST Open House (poster), and the 1997 JIMAR external review (poster). This component of the project is completed, although updating some information in 1996 may be required to facilitate on-going economic analysis of the longline fishery.

Detailed economic analysis of the longline fishery remains incomplete. Several papers have been prepared in draft form but have not yet been submitted for publication.

- Hawaii troll-handline cost-earnings research

The troll-handline cost-earnings study was initiated in late-1995 with development of an information collection approach and instrument. The fishing community was informed of the project through an article in Hawaii Fishing News. Pre-testing was initiated in early 1996 and full fielding with a staff of three is currently underway, with 575 completed interviews on all islands. A complete report of the fielding, and the cost-earnings results, has been completed by JIMAR researcher Marcia Hamilton and is under review.

This component of the project collaborates with two additional JIMAR projects: a JIMAR visiting scientist project on the socio-anthropology of the distinction between recreational and commercial fishing in Hawaii (a thesis project at the University of Washington) and a PFRP recreational valuation project with the University of Maryland which will begin in mid-1996.

- Sociological analysis

JIMAR visiting scientist funds were utilized for two pieces of sociological research

directed toward pelagic fisheries in Hawaii. Ms. Julie Walker completed her masters thesis at the University of Washington's School of Marine Affairs on *work and leisure* in Hawaii's small boat fishery. This thesis identified different components of the fishing experience and developed an alternative framework from the recreational - commercial dichotomy.

Walker then collaborated with the HIFIVE project by conducting a study of charter fishing communities in Hawaii. This report (JIMAR, forthcoming) investigated several charter fishing ports around Hawaii, identifying factors leading to cohesion, conflict, and differences within the community and their effect on charter fishing's role in fishery management.

- Proposed forthcoming HIFIVE research

The HIFIVE project has been extended for a fourth year. Publication of the current longline vessel economic dynamics research is anticipated (one paper is under review). It is also anticipated that the longline economic analysis will be extended into a spatial model of supply response; a comparison of set, trip and vessel economic analysis for the longline fleet; and cost-earnings and patron activity analysis of the Hawaii charter-boat fishery. Charter boat pre-testing has already been initiated.

- Recreational pelagic fisheries economics

In a closely associated project, Hamilton is collaborating with Professor Ted McConnell of the University of Maryland on the preparation and fielding of a study concerning the extent and economic value of recreational fishing in Hawaii. The project is funded separately through JIMAR. Pre-testing of the research instrument was completed in the early spring of 1997 with full fielding to a large subset of Hawaii registered small-boat fishermen scheduled for several waves over the remainder of 1997.

- Fishermen's policy response framework

In a separate part of the basic HIFIVE project, University of Hawaii political scientist Deane Neubauer and his graduate researcher are reviewing publications on modeling fishermen's policy response frameworks by investigating methodologies utilized in other natural resource policy fields, such as forestry and groundwater.

- Collaboration with the University of Hawaii

Collaboration between HIFIVE researchers and the economics research projects of the University of Hawaii's Department of Agricultural & Resource Economics continues. This includes collaboration on the writing of papers, analysis of data, access to confidential fishing vessel information, and joint fielding of dockside research.

<u>Western Pacific Fishery Information Network (WPacFIN)</u>

- Technical support to island fisheries agencies

- American Samoa

Monitoring the growing local longline fishery in American Samoa has required changes to established survey and sampling methodologies and processing software used by the Department of Marine and Wildlife Resources (DMWR).

WPacFIN staff will be designing a new monitoring system and software to process data collected on this fishery. The new system will provide data not being provided through the NMFS logbook program but will hopefully be integrated with the federal logbook data to provide a full picture of this growing fishery.

The creel survey methodology and data processing system that has been used for monitoring all offshore fisheries for the past 10 years will also be modified to accommodate the new sampling regime. Catch, effort, landings, and value data from these systems will be used by the Plan Team in its annual reports.

- Guam Department of Commerce (GDOC)

WPacFIN staff have made several updates to the longline fishery monitoring system maintained by GDOC including on-going improvements to the quality of data available for each vessel off-loading on Guam. Data are now nearly current and include essentially 100% coverage of that fishery. Catch and effort data are available from existing data bases, as are weight measurements for virtually every longline caught fish landed on Guam.

Meetings will be held at GDOC between WPacFIN, GDOC, and SPC staff during March 1997 to lay the groundwork for establishing a length frequency sampling program on Guam. Summary data from GDOC data bases are now being included in the annual pelagics Plan Team report.

- Guam Division of Aquatic and Wildlife Resources (DAWR)

WPacFIN staff have developed and implemented the first modules of a Macintosh-based data base processing system that is allowing DAWR staff to input creel survey data on the offshore fisheries that have not been processed since 1992. These data are used to provide a major portion of the Plan Teams annual report information.

- Commonwealth of the Northern Mariana Islands (CNMI)

Analysis of much of the data from the CNMI Division of Fish and Wildlife's (DFW) fisheries monitoring programs has been completed by the WPacFIN biologist and is in final preparation for release as an Administrative Report. Improvements to sampling programs, including the commercial landings receipt book program, are being discussed between DFW and WPacFIN staff and new methodologies should be finalized during a March on-site visit by WPacFIN staff. Landings, effort, and value data from the receipt book program continue to be the mainstay of the offshore fisheries monitoring program used in the Pelagics Plan Team

reports.

- Hawaii Division of Aquatic Resources (HDAR)

Substantial changes are being undertaken to improve fishery monitoring capabilities and to enhance and improve data available for fisheries management. HDAR and WPacFIN staff, as well as other Honolulu Laboratory staff, are actively investigating ways to streamline and improve HDAR's methods for monitoring Hawaii's fisheries, including cross-validating data from alternate sources to improve overall data quality. Two WPacFIN programmers are working full-time on developing new software to improve HDAR's data quality control and handling capabilities.

A proposed development of high priority to HDAR is computerizing a dealer reporting system. This new system will not only provide a means of processing data submitted by dealers on paper forms, but will permit automated data feeds directly from dealers whose operations are computerized.

Additional work is being done to streamline methodologies and integrate data from HDAR and NMFS data collecting efforts for the same fisheries, e.g. longline.

Townsend Cromwell

The following pelagic research cruises by the NOAA ship Townsend Cromwell were conducted in 1996:

TC 96-02	Swordfish*
TC 96-04	Swordfish*
TC 96-06	Subtropical front*
TC 96-10	Swordfish
TC 96-12	Telemetry and acoustics

* cruises with completed Trip Reports.

The following pelagic cruises are scheduled for 1997:

TC 97-02	Telemetry and acoustics
TC 97-03	Swordfish
TC 97-04	Subtropical front
TC 97-09	Swordfish

JIMAR Research

The following research projects are being carried out in collaboration with the University of Hawaii's Joint Institute for Marine and Atmospheric Research (JIMAR). Projects identified with * are conducted through the Pelagic Fisheries Research Program.

Estimation of bycatch and discards of sharks and other species by the Hawaii longline fishery (Kleiber)*

Evaluation of remote sensing technologies for identification of oceanographic features critical to pelagic fish distributions around the Hawaiian archipelago (Polovina)*

Fishery Oceanography
- Socio-anthropology (Walker)
- Satellite tagging (Weihs)

Hawaii Fleet Industry & Vessel Economics project (Pooley)*

Integration of longline fishery performance model with environmental information (Boggs)*

Integrated information system for pelagic fishery research and management (Skillman)*

Investigation of Pacific broadbill swordfish migration patterns and habitat characteristics using electronic archival tag technology (Boggs)*

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GLOSSARY – PELAGICS

TERM	DEFINITION
Alia	Samoan fishing catamaran, about 30 feet long, constructed of aluminum or wood with fiberglass. Used for various fisheries including trolling, longline, and bottomfishing
AP	Advisory Panel. Appointed industry/government/educational representatives functioning in an advisory capacity to the Council.
AS	American Samoa. Includes the islands of Tutuila, Manua, Rose and Swains Atolls.
ASDPW	Department of Public Works, American Samoa. Also, DPW.
Bycatch	Fish caught in a fishery but discarded or released, except in a recreational fisheries catch and release program.
Commercial	Commercial fishing, where the catch is intended to be sold, bartered, or traded.
CNMI	Commonwealth of the Northern Mariana Islands. Also, Northern Mariana Islands, Northern Marianas, and NMI. Includes the islands of Saipan, Tinian, Rota, and many others in the Marianas Archipelago.
CPUE	Catch-Per-Unit-Effort. A standard fisheries index usually expressed as numbers of fish caught per unit of gear per unit of time, eg., number of fish per hook per line-hour or number of fish per 1,000 hooks. The term catch rate is sometimes used when data are insufficiently detailed to calculate an accurate CPUE.
DAWR	Division of Aquatic & Wildlife Resources, Territory of Guam.
DBEDT	Department of Business, Economic Development & Tourism, State of Hawaii.
DFW	Division of Fish & Wildlife, Northern Mariana Islands.
DLNR	Department of Land & Natural Resources, State of Hawaii. Parent agency for Division of Aquatic Resources (HDAR).
DMWR	Department of Marine & Wildlife Resources, American Samoa. Also, MWR.
EEZ	Exclusive Economic Zone, refers to the sovereign waters of a nation, recognized internationally under the United Nations Convention on the Law of the Sea as extending out 200 nautical miles from shore. Within the U.S., the EEZ typically is between three and 200 nautical miles from shore.

ESA	Endangered Species Act. An Act of Congress passed in 1966 that establishes a federal program to protect species of animals whose survival is threatened by habitat destruction, overutilization, disease etc.
FAD	Fish Aggregating Device; a raft or pontoon, usually tethered, and under which, pelagic fish will concentrate.
FDCC	Fishery Data Coordinating Committee, WPRFMC.
FFA	Forum Fisheries Agency. An agency of the South Pacific Forum, which comprises the independent island states of the South Pacific, Australia and New Zealand. The FFA formed to negotiated access agreements between FFA member countries and distant water fishing nations such as Japan and the USA.
FMP	Fishery Management Plan.
Guam	A U.S. territory in the Marianas Archipelago. South of and adjacent to the Commonwealth of Northern Marianas Islands.
Hawaii	U.S. state. See MHI, NWHI. Composed of the islands, atolls and reefs of the Hawaiian Archipelago from Hawai'i to Kure Atoll, except Midway Islands. Capitol - Honolulu.
HDAR	Hawaii Division of Aquatic Resources. Also, DAR.
HIMB	Hawaii Institute of Marine Biology, University of Hawaii.
HURL	Hawaii Undersea Research Lab.
JIMAR	Joint Institute of Marine and Atmospheric Research, University of Hawaii.
IATTC	Inter-American Tropical Tuna Commission.
Ika-shibi	Hawaiian term for nigh tuna handline fishing method. Fishing for tuna using baited handlines at night with a nightlight and chumming to attract squid and tuna.
Incidental Catch	Fish caught that are retained in whole or part, though not necessarily the targeted species. Examples include monchong, opah and sharks.
Interaction	Catch of protected species, which is required to be released. Examples: Hawaiian monk seals, marine turtles and albatrosses.
Logbook	Journal kept by fishing vessels for each fishing trip; records catch data, including bycatch and incidental catch. Required in the federally regulated longline and crustacean fisheries in the Hawaiian EEZ.
Longline	Fishing method utilizing a horizontal mainline stretching from several hundred yards to many miles in length, suspended for the surface by floats, to which droppers with baited hooks are attached.

Longliner	Fishing vessel specifically adapted to use the longline fishing method.
MFCMA	Magnuson Fishery Conservation and Management Act of 1976. Also, Magnuson-Stevens Fishery Conservation and Management Act of 1996. Sustainable Fisheries Act.
MHI	Main Hawaiian Islands (comprising the islands of Hawai'i, Mau'i, Lana'i, Moloka'i, Kaho'olawe, O'ahu, Kauai', Ni'ihau and Ka'ula).
MSY	Maximum Sustainable Yield.
NMFS	National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. Also NOAA Fisheries.
NOAA	National Oceanic and Atmospheric Administration, Department of Commerce.
NWHI	Northwestern Hawaiian Islands. All islands in the Hawaiian Archipelago, other than the Main Hawaiian Islands (MHI).
OFP	Oceanic Fisheries Program of the South Pacific Commission.
OY	Optimum Yield.
Palu-ahi	Hawaiian term for day tuna handline fishing. Fishing for tuna using baited handlines and chumming with cut bait in a chum bag or wrapped around a stone. Also, drop-stone, make-dog, etc.
PAO	Pacific Area Office, National Marine Fisheries Service. Also, NMFS/PAO.
Pelagic	The pelagic habitat is the upper layer of the water column from the surface to the thermocline. The pelagic species include all commercially targeted highly migratory species such as tuns, billfish and some incidental-catch species such as sharks, as well as coastal pelagic species such as akule and opelu.
PFRP	Pacific Pelagic Fisheries Research Program, JIMAR, University of Hawaii. Also PPFRP.
PMUS	Pacific Pelagic Management Unit Species. Also, PPMUS. Species managed under the Pelagics FMP.
Pole-and-Line	Fishing for tuna using poles and fixed leaders with barbless lures and chumming with live baitfish. Poles can be operated manually or mechanically. Also, fishing vessels called baitboats or aku-boats (Hawaii).
Protected	Refers to species which are protected by federal legislation such as the Endangered Species Act, Marine Mammal Protection Act, and Migratory Bird Treaty Act. Examples: Black-footed and Laysan albatrosses, marine

PT or PPT	Pelagic Plan Team. Advisory body to the Council composed of scientists and fishermen who monitor and manage the fisheries under the jurisdiction of the Pelagics FMP.
Purse seine	Fishing for tuna by surrounding schools of fish with a very large net and trapping them by closing the bottom of the net.
Recreational	Recreational fishing for sport or pleasure, where the catch is not sold, bartered or traded.
SAFE	Stock Assessment and Fishery Evaluation, NMFS.
Sanctuary	Protected area. Commercial/recreational fishing may be restricted.
Secretary	When capitalized and used in reference to fisheries within the U.S. EEZs, it refers to the U. S. Secretary of Commerce.
Small pelagics	Species such as akule (big-eye scad - *Selar* spp.) And opelu (mackerel scad - *Decapterus* spp). These fish occur mainly in shallow inshore waters but may also be found in deeper offshore waters. Not part of the PMUS.
SPC	South Pacific Commission. A technical assistance organization comprising the independent island states of the tropical Pacific Ocean, dependant territories and the metropolitan countries of Australia, New Zealand, USA, France and Britain.
SPR	Spawning Potential Ratio. A term for a method to measure the effects of fishing pressure on a stock by expressing the spawning potential of the fished biomass as a percentage of the unfished virgin spawning biomass. Stocks are deemed to be overfished when the SPR<20%.
SSC	Scientific & Statistical Committee, an advisory body to the Council comprising experts in fisheries, marine biology, oceanography, etc.
Trolling	Fishing by towing lines with lures or live-bait from a moving vessel.
USCG	U.S. Coast Guard, 14th District, Department of Transportation.
USFWS	U.S. Fish & Wildlife Service, Department of Interior. Also, FWS.
VMS	Vessel Monitoring System. A satellite based system for locating and tracking fishing vessels. Fishing vessels carry a transponder which can be located by overhead satellites. Two-way communication is also possible via most VMS systems.
WPacFIN	Western Pacific Fishery Information Network, NMFS.

WPRFMC Also, the Council. Western Pacific Regional Fishery Management Council. One of eight nationwide fishery management bodies created by the Magnuson Fisheries Conservation and Management Act pf 1976 to develop and manage domestic fisheries in the U.S. EEZ. Composed of American Samoa, Guam, Hawaii, and Commonwealth of Northern Mariana Islands.